Department of Transportation

July 2002

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STATE OF TENNESSEE
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John G. Morgan
Comptroller

July 1, 2002

The Honorable John S. Wilder
Speaker of the Senate
The Honorable Jimmy Naifeh
Speaker of the House of Representatives
The Honorable Thelma M. Harper, Chair
Senate Committee on Government Operations
The Honorable Mike Kernell, Chair
House Committee on Government Operations
and
Members of the General Assembly
State Capitol
Nashville, Tennessee 37243

Ladies and Gentlemen:

Transmitted herewith is the performance audit of the Department of Transportation. This audit was conducted pursuant to the requirements of Section 4-29-111, *Tennessee Code Annotated*, the Tennessee Governmental Entity Review Law.

This report is intended to aid the Joint Government Operations Committee in its review to determine whether the department should be continued, restructured, or terminated.

Sincerely,

John G. Morgan
Comptroller of the Treasury

JGM/dww
01-031

State of Tennessee

Audit Highlights

Comptroller of the Treasury Division of State Audit

Performance Audit
Department of Transportation
July 2002

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AUDIT OBJECTIVES

The objectives of the audit were to review the department's legislative mandate and the extent to which it has carried out that mandate efficiently and effectively and to make recommendations that might result in more efficient and effective operation of the department.

FINDINGS

Bridge Inspections Were Not Always Timely
A review of randomly selected bridge inspection files revealed that some bridges (9%) were not inspected within 27 months while others (12.5%) were inspected less than 22 months after the last inspection. Late inspections may cause delays in correcting problems, and early inspections increase the workload of inspection evaluators (page 25).

Many Bridge Inspection Files Reviewed Were Not Evaluated in a Timely Manner
The review of bridge inspection files also revealed that the department did not evaluate 71% of inspection reports within three months of the inspection. Bridge evaluations determine the overall condition and load capacity of a bridge (page 27).

Completion of Department Bridge Maintenance Recommendations Not Documented
Most bridge inspection files reviewed did not indicate whether the inspector's maintenance recommendations were completed. Without follow-up on the recommendations, the department cannot track whether the responsible entity (state or local government) has followed the recommendations and take action if the recommendations were not followed (page 32).

The Department Does Not Always Document Bridge Damage Inspections
Department procedures require documentation of bridge inspections following accidents. However, the department does not always complete a damage report if the damage is minor. In addition, the department does not keep a log of bridge accidents, which makes ensuring that inspections are done and recorded more difficult (page 35).

The Department Does Not Always Obtain the Required Project Environmental Permits in a Timely Manner
Contractors are prohibited from performing certain work without permits from the Department of Environment and Conservation, the U.S. Army Corps of Engineers, and the Tennessee Valley Authority. The project delay increases the cost of completing the project, and the project takes longer than planned (page 36).

The Department Does Not Have Written Guidelines for Determining the Type of Environmental Study to Prepare for State-Funded Highway Projects

The department may decide among two options concerning the type of environmental study to prepare for projects that only receive state funding: no study or a technical report addressing ecological, archaeological, and historical issues. Guidelines would help department staff decide the best option and provide consistency to the decision-making process (page 39).

Independent Assurance Testing of Asphalt Is Not Conducted as Required

The Division of Materials and Tests does not consistently conduct independent assurance tests of asphalt as required by the Federal Highway Administration and its own policies. Failing to perform these tests limits the department's ability to ensure that materials used in roadway projects meet contract specifications (page 41).

Contractor Lab Qualification Policies Not Fully Implemented

Not all contractor labs are being inspected by the department's regional labs as required by department policy. The policy was developed to help ensure that the best highway materials are used in roadway projects. Inspectors conduct a comprehensive assessment of equipment, checking for proper tolerances and condition of equipment (page 44).

Weaknesses in Policies on Timely Submission of Concrete Materials for Testing

The department's policy on the timely submission of concrete samples for testing does not encourage contractors to submit samples on time. Concrete used in areas such as bridges which require a very high strength capability is tested throughout a project to determine its strength (page 47).

No Cost-Benefit Assessment for Contracted Geotechnical Consultants

The department has not determined the advantages of using private consultants for geotechnical investigations. These investigations can identify potential problems, like sinkholes and landslides, that can add to project costs. Cost-benefit assessments can help the department ensure that it obtains the most efficient services at the best quality (page 52).

No Formal Assessments of Geotechnical Consultant Work

The Division of Materials and Tests does not have a formal process to evaluate the quality of work of its geotechnical consultants. The Design Division's contractor evaluation criteria include responsiveness, capability, and preparedness. Information obtained from evaluations could be helpful in identifying problem contractors and making decisions about whether to use them again in the future (page 54).

No Follow-Up Assessments of Products

The department does not assess products used in construction and maintenance projects after they are added to its preapproved product list to help it identify problem products and remove them from the list (page 56).

The Department Did Not Inspect All Airports and Heliports in the Required Time Period

Inspections for 77 airports were overdue from one month to more than two years. Licenses for 48% of the 93 heliports were from one month to seven years past their expiration date. When inspections are not timely, problems such as obstacles and hazardous airport runway or heliport pad conditions may not be discovered (page 58).

The Department Recertified Disadvantaged Business Enterprise (DBE) Vendors Without Verifying Financial Information

Vendors' personal financial statements, needed to determine if the vendor is eligible to be a DBE, were missing supporting documentation. Unless DBE vendors are monitored more closely, the department risks certifying and recertifying vendors that are not in compliance with department policies and federal regulations (page 64).

The Department Is Not Evaluating the Cost-Effectiveness of Contracting Maintenance Work as Required by State Law

The lack of a formal assessment method may affect the department's ability to determine the most efficient means of obtaining maintenance services (page 67).

The Department Could Not Determine the Amount of Time Spent for the Planning and Design Phases of Some Projects

The department does not have a system that provides the planning and design time for all construction projects. Thus, the department cannot determine whether it is meeting its goal to decrease the amount of time a project takes from conception to completion (page 68).

The Department Has Not Updated the Long-Range Transportation Plan as Required by Statute*

It is important to update the long-range plan because changes could affect the state's long-term transportation needs and the department's and legislature's actions to address those needs (page 69).

*Related issues were also discussed in the July 1993 performance audit of the department.

OBSERVATIONS AND COMMENTS

The audit also discusses the following topics: a review of construction project files, the Roadway Maintenance System, and the Pavement Management System (page 21).

"Audit Highlights" is a summary of the audit report. To obtain the complete audit report, which contains all findings, recommendations, and management comments, please contact

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Performance Audit
Department of Transportation

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Performance Audit
Department of Transportation

INTRODUCTION

PURPOSE AND AUTHORITY FOR THE AUDIT

This performance audit of the Tennessee Department of Transportation was conducted pursuant to the Tennessee Governmental Entity Review Law, *Tennessee Code Annotated*, Title 4, Chapter 29. Under Section 4-29-223, the Tennessee Department of Transportation is scheduled to terminate June 30, 2002. As provided for in Section 4-29-115, however, the department will continue through June 30, 2003, for review by the designated legislative committee. The Comptroller of the Treasury is authorized under Section 4-29-111 to conduct a limited program review audit of the department and to report to the Joint Government Operations Committee of the General Assembly. The audit is intended to aid the committee in determining whether the agency should be continued, restructured, or terminated.

OBJECTIVES

The objectives of the audit were

1. to determine the authority and responsibility mandated to the department by the General Assembly
2. to determine the extent to which the department has fulfilled its legislative mandate and complied with applicable laws and regulations, and
3. to recommend possible alternatives for legislative or administrative actions that might result in more efficient and effective operation of the department.

SCOPE AND METHODOLOGY

The audit reviewed the activities of the Tennessee Department of Transportation from May 2001 to February 2002. The audit was conducted in accordance with government auditing standards generally accepted in the United States of America and included

1. a review of applicable statutes and rules and regulations;
2. an examination of the department's documents and policies and procedures;
3. a review of prior performance audits, financial and compliance audit reports, audit reports from other states, and Federal Highway Administration (FHWA) reviews; and
4. interviews with department staff and FHWA staff.

ORGANIZATION AND RESPONSIBILITIES

The Tennessee Department of Transportation was established in 1972 under the provisions of *Tennessee Code Annotated*, Title 4, and Chapter 3, Part 23. The department was created to plan, design, construct, and maintain the state's highway network. The department also has planning and/or regulatory responsibilities for other modes of transportation such as aeronautics, public transit, railroads, and waterways.

The Department of Transportation is headed by a Commissioner; a Deputy Commissioner; a Chief of Administration, who oversees department offices such as Finance, Human Resources, and Information Technology; and a Chief Engineer, who oversees the department's highway planning, design, and operations functions. (See organization chart on the following page.) The department has four regional field offices—one each in Knoxville, Chattanooga, Nashville, and Jackson. (See the map on page 4.) Those offices report directly to a Transportation Director at each office who is responsible for the regional office. The director's responsibilities include highway maintenance and repair, engineering and highway marking, materials and tests, highway beautification, environmental planning, and office administration. However, the Construction, Maintenance, and Materials and Tests divisions set policies and procedures for the programs in those regional field offices.

The department has 4,506 employees—1,306 at its headquarters in Nashville, 845 in Region 1, 709 in Region 2, 811 in Region 3, and 835 in Region 4.

Aeronautics Division

The Aeronautics Division, which reports to the Deputy Commissioner, administers federal and state funding to assist in the location, design, construction, and maintenance of Tennessee's public airports. It also has the responsibility of inspecting and licensing Tennessee's 77 public airports and 93 public heliports annually. The division also provides aircraft and related services for state government executives, staff for the Tennessee Aeronautics Commission, and numerous educational support programs across the state.

Planning

The Assistant Chief of Planning is responsible for the following divisions: Environmental Planning and Permits, Planning, Program Development and Administration, and Transportation, Waterways and Rail.

Environmental Planning and Permits Division

The Assistant Chief Engineer of Planning is responsible for the Environmental Planning and Permitting Section. Environmental Planning is divided further into three sections—Environmental Technical Studies, Environmental Impact, and Permits.

Exhibit 1
Tennessee Department of Transportation

January 2002

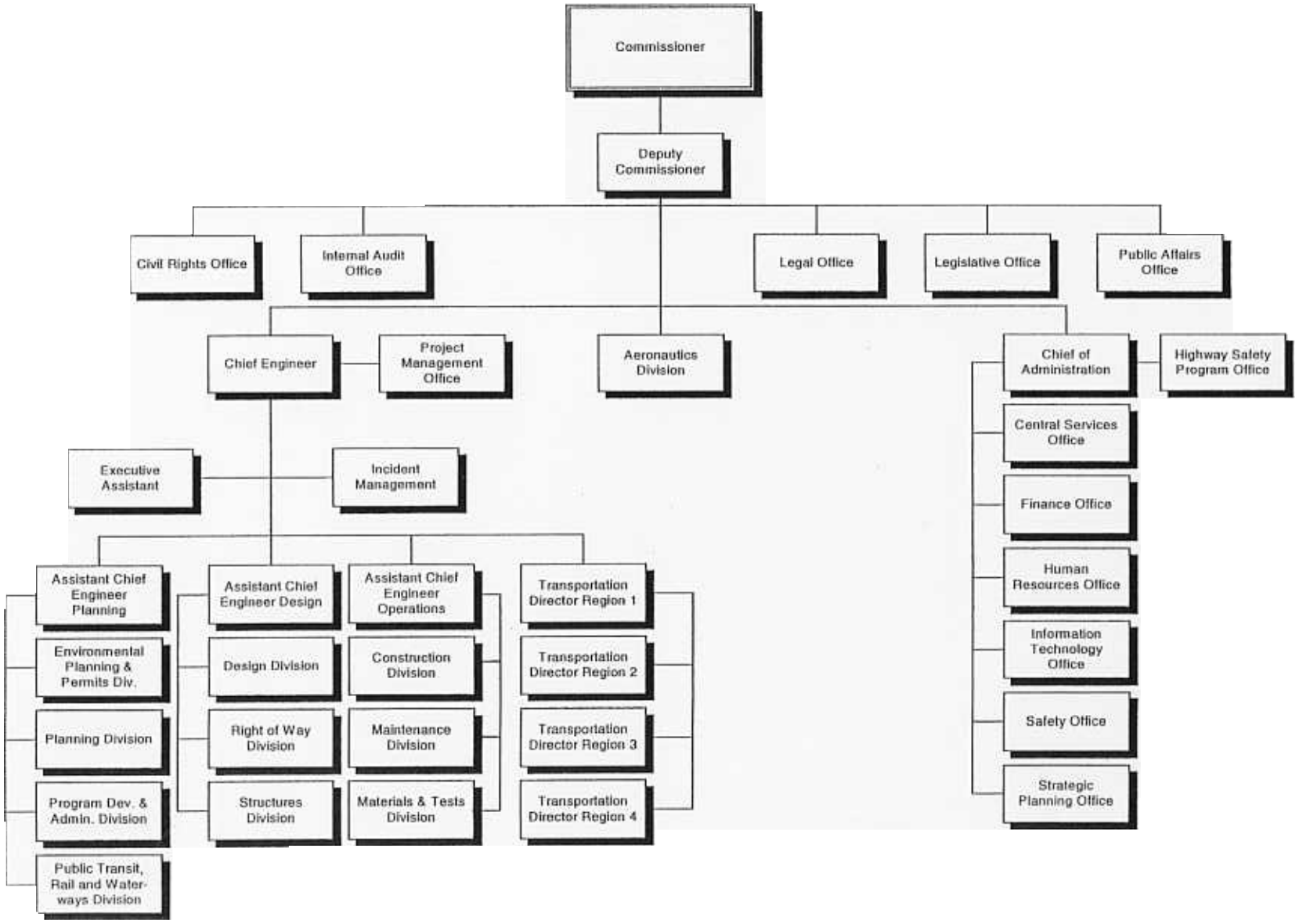
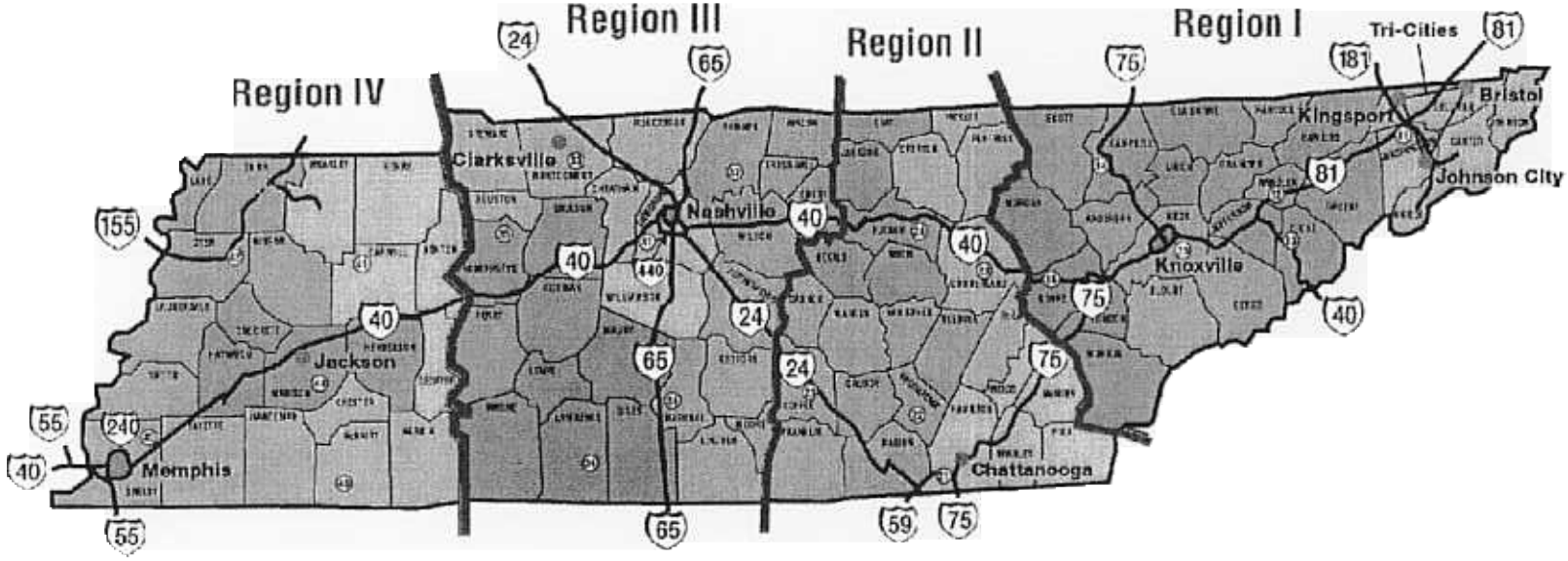


Exhibit 2
Department of Transportation Regions



Source: Department of Transportation.

Environmental Technical Studies Section

The Environmental Technical Studies Section includes archaeologists, biologists, historians, and air quality and noise specialists. The staff conducts on-site data collection, coordinates with resource agencies and other department sections to minimize impacts, prepares designs and conducts follow-up monitoring for mitigation sites, and prepares reports for inclusion in environmental documents or to satisfy specific statutes.

Environmental Impact Section

The Environmental Impact Section is responsible for the preparation of the environmental documents required for the Federal-Aid highway development process, as well as state-funded projects. The section compiles and collates information on 22 social, economic, and environmental issues for each highway project. This information includes a discussion of the purpose and need, social and economic structure of the affected community, land use, farm land, energy, conservation, floodplains, hazardous waste, visual concerns, and construction impacts. This information—combined with the technical studies reports concerning streams, wetlands, and other ecological and water resources, historical and archaeological resources, air quality, and noise—is presented in the environmental documents. These documents can range from the most basic Categorical Exclusion to the more comprehensive Environmental Assessment/Finding of No Significant Impact, to the most complex Environmental Impact Statement. The Environmental Impact Section coordinates project development with federal, state, and local agencies and officials and conducts public meetings and hearings. (See Appendix A for a summary of the process in preparing an Environmental Study and how the approved project is monitored for compliance with environmental issues.)

Permits Section

The Permits Section is responsible for coordinating and applying for all water quality permits needed to advance project construction. Permits for the necessary impacts to wetlands, streams, and rivers must be obtained from federal and/or state environmental agencies, including the U.S. Army Corps of Engineers, the U.S. Coast Guard, the Tennessee Department of Environment and Conservation (TDEC), and the Tennessee Valley Authority. Permit actions require that the section identify and specifically locate the impacted water body, describe the extent of the construction-related impact, and provide plans for the appropriate mitigation of the impacts. The section is also responsible for complying with the National Pollutant Discharge Elimination System permit requirements. This federal program, regulated by TDEC, requires that construction projects incorporate appropriate erosion and sediment controls and the preparation of a storm water pollution prevention plan. The Permits Section is responsible for integrating all activities under this program.

Planning Division

The Planning Division is comprised of three offices that are responsible for all mapping and traffic data as well as developing multi-modal transportation plans. The division is required to include extensive public and local government involvement in project development.

Program Development and Administration Division

The division is comprised of two offices responsible for developing transportation programs, establishing project schedules, coordinating with local governments, and establishing project funding authorizations. This division is responsible for monitoring the 1986 Road Program, a plan that was designed to address transportation needs identified from both traffic and economic standpoints in the different counties in Tennessee. In 1986, the General Assembly passed a three-cent increase in the gas and motor fuel tax to fund a program containing six interstate parkways, 15 priority projects, and acceleration of the existing primary highway program. The plan took effect in June and July of 1986 and was scheduled to be completed no later than the end of the 1998-1999 fiscal year. As of March 2001, 450 projects have been included in the 1986 Road Program. Of these, 350 of the projects (78%) were completed, 35 projects (8%) were still in the construction phase, 54 projects (12%) were under development, and 11 projects (2%) did not have any phase of the project budgeted. Also, according to *Tennessee Code Annotated*, Section 4-3-2303 (13), the department is responsible for developing a Long-Range Transportation Plan and updating the plan every two years.

Public Transportation, Waterways and Rail Division

This division has two offices. The Office of Public Transportation is generally responsible for transit, planning and promotion, research, and technical assistance. The Office of Rail and Water Transportation has three areas of responsibility: the Railroad Regulatory Section, the Grade Crossing Safety Section, and the Rail and Water Section.

Office of Public Transportation

The office provides funding to promote efficient transit systems and is responsible for the development of programs such as Statewide Ridesharing and Elderly/Disabled Transportation. The department contracts with local agencies to provide these services. The Rural Transportation Program provides funding to grantees who provide services to 2.6 million citizens in all of the state's 95 counties. In order to meet the special needs of the clients with disabilities, over 40% of the fleet vehicles in these counties are equipped with wheelchair lifts.

Office of Rail and Water Transportation

The office is divided into three sections: Railroad Regulatory, Grade Crossing Safety, and Rail and Water.

Railroad Regulatory Section: This section is responsible for monitoring the number of hours that railroad companies' employees work and the inspection of highway-rail crossings, rail yards, industrial sites and areas, switches, relays, and control points. The section is also responsible for power brake laws and track conditions; drug and alcohol programs and prohibitions; operating and safety procedures; and the state safety oversight program for rail guideway systems, train derailments, and hazardous material releases. There are 2,953 railroad track miles and 23 railroad operators in the state. The department, as of November 1, 2001, had two track inspectors, one signal and train control inspector, two motive power and equipment inspectors, and two operating practices inspectors. The department did not have a hazardous materials

inspector, but management stated that this is a position that is needed considering material produced at Oak Ridge and other industry-related hazardous materials transported in Tennessee.

Grade Crossing Safety Section: This section oversees the 23 USC 130 federal priority list (Highway-Rail Crossing Program), which includes all known public railroad grade crossings and the minimum protection program. Three inspectors from the Railroad Regulatory Section and one inspector from the Grade Crossing Safety Section perform these inspections. The section also performs the following duties: railroad bridge review, railroad crossing inventories, railroad crossing closure, and preempted signal review. According to the Transportation Manager, Waterways and Rail Division, each of the 3,326 public railroad crossings in the state is inspected anywhere from one to four times per year (more than once if reinspections are necessary). Track inspectors examine all crossings once a year, all signals are inspected once a year, and each crossing is inspected for safety reasons once a year. Diagnostic teams inspect tracks when the department is informed of new public railroad grade crossings and they are placed on the priority list.

The Director of Right-of-Way (ROW) is involved in the approval process for railroad crossing projects. The director takes an objective look at the projects to make sure things are in order. Diagnostic teams made up of employees in the utilities division, railroad section, and FHWA inspect a crossing once it is placed on the priority listing to see what repairs are necessary. Once the diagnostic team has assembled the report, it is given to the Transportation Manager, Waterways and Rail Division, for approval. The project is then taken to the Director of ROW, who looks at the report, compares the project to the priority listing, and asks general questions concerning costs, funding, and other matters. The director then gives approval if everything is in order. The ROW review step was put into place in late 1999 and is outlined in department's *Procedural Plan for Highway/Railroad Grade Crossing Safety Projects*. This extra step creates another check to make sure projects initiated are within departmental requirements. (The internal control was in response to a Division of State Audit Financial and Compliance audit report covering fiscal years 1998 and 1999. The audit noted that decisions for upgrading railroad crossings were made which were unjustified and inappropriate.)

Rail and Water Section: The section provides funding for the Tennessee Tombigbee Waterway System and port feasibility studies. It works with the TVA and Corps of Engineers to prepare port feasibility studies. The section is also responsible for Shortline railroad track and railroad bridge rehabilitation and waterway assistance. This section oversees the Federal Railroad Administration's Local Rail Freight Assistance Grant Program. However, the federal government has not provided any grant funds in several years.

Design

The Assistant Chief Engineer for Design is responsible for the Design, Right-of-Way, and Structures divisions.

Design Division

This division oversees the survey and design functions of the department, including the performance of aerial and ground surveys, the establishment of roadway design criteria, and the development of right-of-way and construction plans for proposed highway improvement projects. The Design Division also is responsible for Plans Sales.

Right-of-Way Division

This division is responsible for the appraisal and acquisition of land needed for state highway construction. The division consists of the Right-of-Way Office and the Utilities Office. The Utilities Office coordinates local utility and railroad relocation efforts for highway construction.

Structures Division

The Structures Division has four sections: Structural Design, Hydraulic Design, Structure Inventory and Appraisal, and Bridge Repair.

Structural Design Section

The Structural Design Section is responsible for the preliminary design, final design, and detailing of structures and for the approval of Shop Drawings during construction. The section is responsible for the direction and oversight of department staff and consultants. On average, the office produces designs for 120 bridges annually, 95% of which are completed by staff designers; the remaining 5% require the aid of consultants.

The bridge designs produced by the section include both concrete and steel girder bridges over roadways, railroads, and waterways. Designs for retaining walls, box culverts, noise barrier walls, and other miscellaneous structures are also the responsibility of this office.

Hydraulic Design Section

This section is responsible for the hydraulic design of bridges crossing streams. The section also reviews the replacement or rehabilitation of any existing structure six meters long or longer to determine if hydraulic criteria govern the site.

The section also ensures that Grant Bridges and Federal Emergency Management Act Bridge Replacements meet current hydraulic design policies of the department. The Grant Bridge Program of 1982 provides partial funds to local governments for replacement or refurbishing of deficient bridges. To be eligible, the local government must be in compliance with the National Bridge Inspection Standards at the time the contract between the state and local government is executed. These standards require that all bridges with a load rating less than 15 tons be properly closed or posted with appropriate load rating signs. The department approves all plans before funding is provided to the local government.

Structure Inventory and Appraisal Section

The Structure Inventory and Appraisal (SI&A) Section is primarily concerned with the safety and condition of 19,563 highway bridges in Tennessee. The SI&A Section maintains a complete computer inventory of all of these bridges which is updated as new inspection data become available. Seventeen inspection teams located throughout the state conduct the bridge inspections. A bridge is classified as "structurally deficient" if it has one or more structural problems. If the bridge is structurally sound but the design is not adequate for current traffic needs, the bridge is classified as "functionally obsolete." (See Table 1.) State inspection teams do not inspect bridges maintained by the federal government, such as National Park bridges or those which have been identified as private bridges. The inspection information is used to plan bridge replacement and repair activities at the state level and is also submitted annually to the Federal Highway Administration (FHWA) to help allocate national highway funding. The information is also used to post weight restrictions and, if necessary, close bridges that have deteriorated or have been damaged due to traffic-related collisions or other causes.

The SI&A Office also works with the vehicle permit office to route overweight and oversize commercial vehicles through the state. These trucks often carry heavy factory or earth-moving equipment that cannot be moved by other means. These vehicles, if unregulated, could damage bridges by their weight or bridge collisions. Using the inspection information, the SI&A Office can route these vehicles safely.

Table 1: Bridge Statistics, 1995 Through 2000

TOTAL NUMBER OF BRIDGES

	State		Local		
Year	Number of Bridges	Percentage of Total Number	Number of Bridges	Percentage of Total Number	Total Number of Bridges
1995	7,169	37.9	11,758	62.1	18,927
1996	7,230	38.1	11,741	61.9	18,971
1997	7,347	38.3	11,822	61.7	19,169
1998	7,373	38.4	11,828	61.6	19,201
1999	7,442	38.4	11,961	61.6	19,403
2000	7,462	38.4	11,986	61.6	19,448

BRIDGES CLASSIFIED AS STRUCTURALLY DEFICIENT (SD) *

	State			Local			
Year	Number of Bridges	Percentage of Total Number	Percentage of SD Bridges	Number of Bridges	Percentage of Total Number	Percentage of SD Bridges	Total Number of SD Bridges
1995	529	7.4	20.1	2,105	17.9	79.9	2,634
1996	519	7.2	21.9	1,850	15.8	78.1	2,369
1997	498	6.8	21.8	1,782	15.1	78.2	2,280
1998	529	7.2	23.6	1,716	14.5	76.4	2,245
1999	504	6.8	25.0	1,512	12.6	75.0	2,016
2000	450	6.0	23.2	1,487	12.4	76.8	1,937

BRIDGES CLASSIFIED AS FUNCTIONALLY OBSOLETE (FO) **

Year	STATE			LOCAL			
	Number of Bridges	Percentage of Total Number	Percentage of FO Bridges	Number of Bridges	Percentage of Total Number	Percentage of FO Bridges	Total Number of FO Bridges
1995	1,450	17.0	45.7		12.3	54.3	2,668
1996	1,214	16.8	44.9	1,488	12.7	55.1	2,702
1997	1,184	16.1	43.8	1,522	12.9	56.2	2,706
1998	1,143	15.5	40.9	1,655	14.0	59.1	2,798
1999	1,227	16.5	38.0	2,001	16.7	62.0	3,228
2000	1,190	15.9	36.7	2,056	17.2	63.3	3,246

* Structurally Deficient: Has one or more structural problems.
** Functionally Obsolete: The bridge is structurally sound, but the design is not adequate for current traffic needs.

Bridge Repair Section

The Bridge Repair Section is responsible for the design and plans preparation of bridge repair projects on state-maintained bridges. Plans are developed by both in-house staff and consultant firms under contract with the department.

Repair projects are let to contract through the normal bid process and administered by the Construction Office. During the construction phase, the repair section assists the region construction personnel in construction inspection and in solving any problems that may arise.

OPERATIONS

The Assistant Chief Engineer for Operations is responsible for the Construction, Maintenance, and Materials and Tests divisions.

Construction Division

The Construction Division is responsible for proposals, bids, and contracts for Department of Transportation highway and bridge projects and for contract administration on department projects. The division also prequalifies contractors prior to their bidding on projects, provides plans for projects to contractors interested in bidding, and writes department specifications. The division has four regional construction managers who administer the progress of projects in each of the four regions of the state.

Maintenance Division

The Maintenance Division consists of 4 offices: Maintenance Administration, Traffic Engineering, Maintenance Asset Management, and Highway Beautification. The division performs highway maintenance including resurfacing, mowing and clearing roads of snow and ice, highway signing and marking, rest area services, traffic engineering investigations, and billboard control. It also provides grants to local governments to improve roads and bridges.

Maintenance Administration Office

This division is responsible for state-aid programs for local roads and bridges, coordinating field staff during emergencies, and purchasing. The office also houses the landscape architect responsible for designing landscape architectural projects, programs, procedures, and contract administration of projects in the field.

Traffic Engineering Office

This office is responsible for speed zone determination, traffic signal placement, determination of high hazard locations, and naming of roadways and bridges.

Maintenance Asset Management Office

This office is in charge of the maintenance contracts for services such as mowing, resurfacing, guardrail repair, sign refurbishing, and vegetation removal. It is also responsible for the Maintenance Management System (an information system to plan maintenance projects), the division's budget, city maintenance contracts, rest area maintenance, interstate logo signs, and tourist-oriented destination signs. In winter, the office also clears roads of snow and ice.

Highway Beautification Office

This office's responsibilities include the following programs: the outdoor advertising control program, the junkyard control program, litter control grants, the adopt-a-highway program, and the wildflower program.

Materials and Tests Division

The Materials and Tests Division consists of three sections: Field Operations, Geotechnical Engineering, and Research and Product Evaluation. The division is responsible for performing all geotechnical investigations for the department and ensuring that all materials used on projects meet the specifications prescribed by the American Society for Testing and Materials, the American Association of State Highway and Transportation Officials, and/or the department. The division, in conjunction with other divisions, develops specifications for department projects.

Field Operations Section

This section provides technical assistance and support on the manufacturing, construction, design, and acceptance testing of materials used in highway and bridge construction. Working with other department staff, the section develops statewide policies, procedures, and specifications for materials acceptance and construction procedures.

Geotechnical Engineering Section

This section investigates the geotechnical aspects of the general roadway alignment chosen for a particular area and makes recommendations to the project designer. These recommendations include cut and fill slope design, foundation recommendations, and mitigation of problem areas. The section is also involved in the construction phase including approval for bridges and retaining walls, wet or soft soil conditions encountered by a contractor, and sink holes that occur during construction activity.

Research and Product Evaluation Section

This section tests and evaluates all new products proposed for use in Tennessee's highway program. It also distributes information gained from its testing and maintains the department's Qualified Product List.

Materials and Test Standards Associations

The department uses American Society for Testing and Materials (ASTM) and American Association of State Highway and Transportation Officials (AASHTO) standards as guidelines for developing standards for Tennessee, which are documented in the department's *Standard Specifications for Road and Bridge Construction*. ASTM is an organization that provides for the development and publication of voluntary consensus standards for materials, products, systems, and services. Its members include producers, users, consumers, and representatives of government and academia. They develop documents that serve as a basis for manufacturing, procurement, and regulatory activities. ASTM develops standard test methods, specifications, practices, guides, classifications, and terminology for metals, paints, plastics, textiles, petroleum, construction, energy, the environment, consumer products, medical services and devices, computerized systems, and electronics. Technical research and testing is performed voluntarily by ASTM members located throughout the world. ASTM standards, which are used by all states, are published each year in the *Annual Book of ASTM Standards*.

The American Association of State Highway and Transportation Officials (AASHTO) is composed of state highway departments or agencies. The U.S. Department of Transportation is an ex-officio member. AASHTO develops voluntary standards and guidelines which are widely used in the design, construction, maintenance, and operation of national highway and transportation facilities. In addition, AASHTO operates the National Transportation Product Evaluation Program, which assesses the quality and utility of materials used in infrastructure; and the AASHTO Materials Reference Laboratory (AMRL), a program that promotes uniformity and quality in laboratory testing of asphalt and soil. The department, along with other state highway agencies, is a member of AASHTO committees that meet periodically to review standards and issues and propose needed updates.

DEPARTMENT OF TRANSPORTATION MONITORING OF PROJECTS

The department has four regional field offices (Region 1 in Knoxville, Region 2 in Chattanooga, Region 3 in Nashville, and Region 4 in Jackson.) There is a construction office, a maintenance office, and a materials and tests office in each regional field office. In addition, each regional field construction office oversees 10 or 11 construction field units. The regional construction office assigns each contract to a project supervisor in one of the region's construction units. The project supervisor then assigns the contract to an inspector in that unit. The assigned inspector is on the project site daily to supervise work of the contractor. The inspector maintains a Project Diary and for each day of work on the project records

- the weather,
- type of work performed,

- materials used,
- state staff on site, and
- state staff on site, and

The project supervisor oversees the project and is available when needed by the inspector(s), contractor(s), etc., should any questions or other matters arise. The supervisor visits the project site regularly.

The project supervisors of each unit report to one of the four regional construction offices. Each region has one regional supervisor and two assistant construction supervisors. The regional supervisor and his assistants are there to answer questions from the supervisor, contractor, or central office; and to help solve problems such as errors on the plans. When the unit project supervisor needs assistance, he calls on regional construction. Staff from regional construction go to the preconstruction meetings held for the projects. Regional construction staff also visit the site during the project and at the final inspection of the project.

The regional construction office submits monthly construction status reports to the central construction office in Nashville. Starting in July 1999, a project is flagged in the report if the progress of work by that contractor falls behind by 15% in terms of projected dates for completion of stages of the work. Then the department sends a letter to the contractor asking for an explanation of the delays and planned improvements. In those cases, the department will not allow a contractor to bid on new projects while that contractor is behind on others.

DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

In accordance with regulations of the U.S. Department of Transportation (U.S. DOT), 49 *Code of Federal Regulations* (CFR), Part 26, the Tennessee Department of Transportation established the Disadvantaged Business Enterprise (DBE) program. The department receives federal financial assistance from the U.S. DOT to conduct the DBE program, and as a condition of receiving assistance, the Civil Rights Office agrees to comply with 49 CFR, Part 26.

Within the Civil Rights Office, the Small Business Development program director serves as the DBE Liaison Officer and is responsible for implementing all aspects of the DBE program. It is the policy of the department to ensure that each DBE has an equal opportunity to receive and participate in department-assisted contracts. Specifically, it is the department's policy to adhere to the following:

- to ensure that nondiscrimination is adhered to in the awarding of department-assisted contracts,
- to ensure that DBEs can compete fairly for department-assisted contracts,
- to ensure the DBE program is in accordance with applicable law,
- to ensure only those firms meeting the eligibility standards of 49 CFR, Part 26, are permitted to participate as DBEs,

- to minimize barriers to participation in DBE contract opportunities, and
- to assist in the development of firms that can compete successfully in a market outside of the DBE program.

(See finding 14 for a listing of the federal guidelines to qualify for this program and the documentation that the department requires to determine whether a business owner is eligible to participate in the DBE program.)

As of February 2002, there were 290 DBE certified vendors. The office divides the vendor list into three distinct categories: construction, consultants/engineers, and suppliers. Approximately 60% of the vendors fall into the construction category, 27% are consultants/engineers, and 13% are suppliers.

The ethnic composition of the DBE owners was provided in the DBE Annual Reports for Federal Fiscal Years 1997 through 2001. The information shows that the number of construction DBE contracts ranged from 136 in fiscal year 1998 to a high of 162 in fiscal year 1997. The number of construction contracts was 149 in fiscal year 2001. White Americans and African Americans received 90% of the contracts with the percentage for White Americans ranging from 49% to 56.6% and African Americans receiving 34.6% to 43.5% over the four-year period (see Table 2).

The number of consultant contracts awarded to DBE owners ranged from a low of 46 in fiscal year 1997 to a high of 74 in fiscal year 2000 (see Table 2). The majority of the contracts were distributed among five ethnic groups: White Americans (39.1% to 48.9%), African Americans (29.9% to 40.7%), Asian/Indian Americans (3.4% to 19.6%), Asian Pacific Americans (2.1% to 6.8%), and Hispanic Americans (4.6% to 10.9%). The information indicates that there has been a decline in the number of consultant contracts to Hispanic, Asian/Indian, and Asian Pacific American groups during fiscal years 1998 through 2001 (see Table 2).

The number of supplier contracts awarded to DBE owners ranged from 18 in fiscal year 1997 to 37 in fiscal year 2000. The majority of the supplier contracts have gone to White Americans (44.3% to 65%) and African Americans (15% to 38.9%) over the five-year period. Native Americans, Asian Pacific Americans, and "Other" groups received about 17% of the supply contracts in fiscal year 1997. In fiscal years 1998 through 2001, Native Americans and Hispanic Americans received about 11% to 20% of the supplier contracts (see Table 2).

The information also contained the overall number of contracts issued and the overall dollar amount of the contracts. The information was categorized according to type of DBE firm. The office did not have information concerning contracts issued to White Women Business Enterprises (WWBE) for fiscal years 1996 and 1997. For 1998-2001, WWBE received 72%, Minority Business Enterprise (MBE) received 23%, and Minority Women Business Enterprise (MWBE) received 5% of the contracts issued to DBE firms. (See Table 3.)

Table 2: Disadvantaged Business Enterprise List by Type of Service and Ethnic Background (Federal Fiscal Years 1997 Through 2001)

DBE Ethnic Background	1997 Construction	Ethnic Percent	1998 Construction	Ethnic Percent	1999 Construction	Ethnic Percent	2000 Construction	Ethnic Percent	2001 Construction	Ethnic Percent
African Americans	56	34.6%	49	36.0%	53	37.1%	70	43.5%	64	43.0%
Native Americans	4	2.5%	6	4.4%	3	2.1%	4	2.5%	3	2.0%
Hispanic Americans	8	4.9%	6	4.4%	3	2.1%	4	2.5%	5	3.3%
White Americans	91	56.2%	73	53.7%	81	56.6%	80	49.7%	73	49.0%
Asian/Indian Americans	2	1.2%	2	1.5%	2	1.4%	2	1.2%	3	2.0%
Asian Pacific Americans	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other**	1	0.6%	0	0.0%	1	0.7%	1	0.6%	1	0.7%
Total	**162**	**100%**	**136**	**100%**	**143**	**100%**	**161**	**100%**	**149**	**100%**
	1997 Consultants	**Ethnic Percent**	**1998 Consultants**	**Ethnic Percent**	**1999 Consultants**	**Ethnic Percent**	**2000 Consultants**	**Ethnic Percent**	**2001 Consultants**	**Ethnic Percent**
African Americans	14	30.4%	14	29.9%	24	40.7%	27	36.5%	26	40.0%
Native Americans	0	0.0%	1	2.1%	0	0.0%	0	0.0%	0	0.0%
Hispanic Americans	5	10.9%	3	6.3%	4	6.8%	5	6.8%	3	4.6%
White Americans	18	39.1%	23	48.9%	25	42.3%	34	45.9%	30	46.2%
Asian/Indian Americans	9	19.6%	5	10.7%	2	3.4%	4	5.4%	3	4.6%
Asian Pacific Americans	0	0.0%	1	2.1%	4	6.8%	4	5.4%	3	4.6%
Other**	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	**46**	**100%**	**47**	**100%**	**59**	**100%**	**74**	**100%**	**65**	**100%**
	1997 Suppliers	**Ethnic Percent**	**1998 Suppliers**	**Ethnic Percent**	**1999 Suppliers**	**Ethnic Percent**	**2000 Suppliers**	**Ethnic Percent**	**2001 Suppliers**	**Ethnic Percent**
African Americans	7	38.9%	11	33.4%	3	15.0%	11	29.7%	10	37.0%
Native Americans	1	5.6%	2	6.0%	1	5.0%	1	2.7%	1	3.7%
Hispanic Americans	0	0.0%	2	6.0%	3	15.0%	3	8.1%	1	3.7%
White Americans	8	44.3%	17	51.6%	13	65.0%	22	59.5%	15	55.6%
Asian/Indian Americans	0	0.0%	1	3.0%	0	0.0%	0	0.0%	0	0.0%
Asian Pacific Americans	1	5.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other**	1	5.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	**18**	**100%**	**33**	**100%**	**20**	**100%**	**37**	**100%**	**27**	**100%**

Source: DBE Progress Reports for 1997, 1998, 1999, 2000, and 2001, obtained from Small Business Division.

**Includes handicapped and disabled persons with no specification about ethnic background.

During 1998-2001, the overall dollar amount of the contracts awarded to DBE averaged about $59,995,366 each year. According to the information, WWBE received 64%, MBE received 29%, and MWBE received 7% of the overall contract dollar amounts. (See Table 3.)

INTELLIGENT TRANSPORTATION SYSTEM

The Intelligent Transportation System (ITS) Strategic Plan process was implemented in 1997. ITS is a system designed to combine the use of technologies to support specific applications and offers the potential to improve operating efficiency, improve safety, reduce congestion, improve reliability, and improve planning information. A few of the projects that have developed due to ITS are discussed below.

The Fog Detection and Warning System began in December 1993 before the ITS coordinating committee was established. The system is located in a three-mile fog-prone area of Interstate 75 at the Hiwassee River crossing and also includes eight-mile approaches on each side of the river in Bradley and McMinn counties. Units beside the road measure visibility. When there is limited visibility, the Highway Patrol activates warning signs. Before installation of the Fog Detection and Warning System, there was a fog-related accident involving 99 vehicles in which 12 people were killed and 42 injured. According to the department, since the system was installed in 1993, there have been no accidents reported due to fog.

The Cumberland Gap Tunnel, a set of twin tunnels opened in 1996, uses a variety of technologies. Technology includes television monitors for identifying problems inside or outside the tunnels, message signs controlled by operators in Kentucky that can be varied depending on the problem, and communication devices that allow communication with wreckers, fire rescue trucks, and ambulances. Tennessee works with Kentucky in the operation and maintenance of the Cumberland Gap Tunnel.

Currently under development is a Freeway Traffic Control and Incident Management Plan. With this plan, the department will install equipment to detect vehicular speeds and volumes, video camera surveillance equipment, changeable message signs, and a communication system to link these to a traffic operations center that will operate and maintain the system. The project for Nashville's I-65 north corridor is under construction and is scheduled to be completed in October 2002. The study for the 35.5-mile Knoxville project began recently, and construction should begin in fall 2002. Memphis' study should be complete by the summer of 2002.

Emergency Reference Markers installed every 1000 feet (2/10-mile) along the heavily traveled areas of urban interstates show the direction of travel and the mile and tenths of a mile number for accident location purposes. These markers were installed because many accidents are reported from cellular phones and some motorists have difficulties telling emergency response agencies the exact location of the incident. The reference markers have been funded with 80% federal and 20% state funds.

Table 3: Disadvantaged Business Enterprise Contracts Issued and Dollar Volume Federal Fiscal Years (October 1 - September 30) 1996 Through 2001

Number of Contracts by Type of DBE Firm and Year

Type of DBE Firm	1998	%	1999	%	2000	%	2001	%	Overall Total (1)	Overall % (1)
Minority Man Business Enterprise (MBE)	57	16%	88	20%	91	27%	104	32%	340	23%
Minority Women Business Enterprise (MWBE)	25	7%	33	8%	7	2%	2	1%	67	5%
White Women Business Enterprise (WWBE)	277	77%	309	72%	233	70%	221	67%	1,040	72%
White Man Business Enterprise (WMBE) *	0	0%	0	0%	2	1%	3	1%	5	0%
TOTAL	359	100%	430	100%	333	100%	330	100%	1,452	100%

* WMBE category was not created until fiscal year 2000. (Included one disabled and one economically disadvantaged white male.)
Source: 1996 –2001 DBE Progress Reports obtained from the Disadvantaged Business Enterprise Program.

(1) Overall total and percentage does not include federal fiscal years 1996 and 1997 due to a lack of information for the WWBE category.

Dollar Volume by Type of Contract and Year

Type of DBE Firm	1998	%	1999	%	2000	%	2001	%	Overall Total	Overall %
Minority Business Enterprise (MBE)	$13,663,420	22%	$24,603,018	29%	$17,259,768	32%	$13,988,623	36%	$69,514,829	29%
Minority Women Business Enterprise (MWBE)	$8,630,387	14%	$1,705,576	2%	6,184,483	12%	$254,702	1%	$16,775,148	7%
White Women Business Enterprise (WWBE)	$41,183,902	64%	$57,211,140	69%	$30,221,501	56%	$24,823,525	63%	$153,440,068	64%
White Man Business Enterprise (WMBE) *	0	0	0	0	$57,883	0%	$193,534	0%	$251,417	0%
TOTAL	$63,477,709	100%	$83,519,734	100%	$53,723,635	100%	$39,260,384	100%	$239,981,462	100%
% Change			24%		-55%		-37%			

Installation of ITS technologies at selected welcome centers has been completed. The technologies allow visitors to receive information on weather and traffic conditions in and around Tennessee and Kentucky.

Freeway Service Patrol (HELP)

HELP trucks patrol the most heavily traveled freeways in Chattanooga, Knoxville, Memphis, and Nashville, from 6:00 a.m. to 8:00 p.m., Monday through Friday. When requested by law enforcement agencies, the HELP trucks may also work on weekends and late at night during special events that create high traffic volume. The program began in 1999 for the purpose of reducing traffic congestion, improving safety, and assisting motorists in distress. In July 2001, the HELP Program delivered its 100,000th motorist assist. The HELP Program's mission statement is as follows.

> The mission of HELP is to minimize traffic congestion, promote the safe movement of people and products, and improve the travel environment. We work in partnership with emergency response agencies and other department units as part of a highway incident management team. We are committed to performing all duties in a professional manner.

According to the department, traffic congestion is a serious and growing problem in Tennessee, especially in the major travel corridors in the metropolitan areas, where traffic congestion is more than an inconvenience. Congestion contributes to lost time when individuals are caught in traffic and can cost businesses time and money when supplies or customers are delayed. Automobiles and trucks delayed in traffic congestion add more pollutants to our air and waste energy. Traffic congestion causes traffic crashes and aggravates road rage.

State and local governments are working together to expand the capacity of our transportation systems, but new infrastructure alone will not solve the problems associated with congestion. The department attributes the problems of congestion to two factors:

- 60% of all freeway congestion is non-recurring, caused by incidents such as wrecks, debris in the road, and disabled vehicles and not by limited highway capacity; and
- 20% of all freeway crashes are "secondary," occurring because the roadway is blocked by an earlier incident.

The department is giving more attention to "highway incident management," and is promoting "quick clearance" of highway incidents. The HELP program is probably the most visible program in the department.

The HELP trucks operate on assigned routes, which are restricted to the core areas of each city, so that the operators can respond quickly to incidents that have the most impact on the total freeway system. The routes sometimes vary by time of day, and the HELP trucks are sometimes sent off of their regular routes to help with traffic control at major incident scenes.

The "lime-yellow" HELP trucks are equipped with a variety of tools, emergency medical equipment, traffic cones, traffic control signs, absorbent material, emergency and work lights, and other equipment to assist with incident management. The trucks also carry gasoline, diesel fuel, and water. The HELP operators also carry two-way radios and cell phones.

The HELP truck operators are specially trained in

- First aid and emergency medical care
- Traffic control
- Highway Incident Management
- Extinguishing vehicle fires
- Hazardous materials
- Radio communications
- Diversity
- Using emergency equipment

A summary of the major services that the HELP program has provided for congestion mitigation and motorist assists is presented in Table 4.

Table 4: Major Services Provided by HELP Program as of February 2002

Type of Service	Knoxville (Service began July 1999)	Nashville (Service began July 1999)	Chattanooga (Service began July 2000)	Memphis (Service began July 2000)	Statewide (Service began July 1999)
Provided traffic control	9,142	13,795	14,205	4,398	41,540
Tagged abandoned vehicles	3,501	6,879	2,804	6,162	19,346
Changed tires	3,463	5,798	2,059	4,709	16,029
Provided fuel	2,430	2,836	1,505	2,525	9,296
Relocated from travel lanes	1,276	3,935	2,221	1,327	8,759
Removed debris from lanes	3,140	2,110	2,106	1,813	9,169
Provided first aid	264	247	278	97	886
Total of Major Services	23,216	35,600	25,178	21,031	105,025
Overall Number of Services	35,055	45,288	21,018	29,789	131,150

FEDERAL HIGHWAY ADMINISTRATION

The Tennessee Department of Transportation signed the Transportation Equity Act with the Federal Highway Administration (FHWA) in September 1998 to amend Section 106 of Title 23 United States Code revising oversight provisions of Federal Highway projects. The agreement specifies the department's and FHWA's respective responsibilities for administering national highways. Specifically, the agreement stipulates that the state Department of Transportation is responsible for

- projects on the National Highway System (NHS) (the NHS includes all interstates and major state routes) but not on the Interstate System;
- projects on the Interstate System with an estimated construction cost of less than $1 million;
- resurfacing, restoration, and rehabilitation projects on the Interstate System; and
- projects not on the NHS.

The agreement further indicates that the department has elected to assume a number of other responsibilities. These responsibilities include

- project design review;
- bridge layout approval;
- approval of right of way acquisition;
- approval of planning, surveying, and engineering;
- approval of consulting engineering agreements;
- approval of utility relocations and railroad agreements;
- concurrence in award of contract;
- construction project inspection;
- approval of supplemental agreements for federal-aid participation; and
- final acceptance of the project.

According to FHWA staff, the agreement further stipulates that the FHWA maintains the responsibility for all projects on the Interstate System that involve new construction or reconstruction with an estimated construction cost of $1 million or more. Moreover, if the FHWA is involved in approving plans, specifications, and estimates for any NHS project, then FHWA must also review and approve design exceptions to standards applicable to that project.

On those NHS projects for which the department has elected to assume oversight responsibility, or which are funded by other than federal-aid funds, the department will evaluate, approve, and document design exception decisions as if doing so for the FHWA. Design

exceptions approved by the department for FHWA are subject to FHWA oversight through periodic process reviews. To facilitate its oversight function, FHWA inspects projects during each phase of the process and generates an inspection report. FHWA staff stated that the department has a good record of correcting problems.

The department provides monthly construction status reports to the FHWA. These reports identify each project (not only those overseen by FHWA), the type of work being conducted, and its completion status. In the event that a project is behind schedule, the report also identifies reasons for the delay.

OBSERVATIONS AND COMMENTS

The issues discussed below did not warrant findings but are included in this report because of their potential effect on the operations of the department and on the citizens of Tennessee.

REVIEW OF CONSTRUCTION PROJECT FILES

The department's Division of Construction has written policies for prequalification of contractors, bid-letting, and construction agreements. The division also has *Standards for Specifications for Road and Bridge Construction* and supplements to it, which specify procedures and materials to be used in construction projects. We reviewed a sample of contracts the department awarded in a February 2, 2001, bid-letting. In general, the 25 contract files contained required documentation. For example, for all the files reviewed, all contractors were on the prequalified list, advertising requirements were met, and noncollusion and lobbying certifications were signed (when required). All contract awards were made within 30 days, and bonds were obtained after contracts were awarded. One exception was that none of the contracts were executed within 10 days as required.

We also reviewed a sample of files of prequalified contractors. The department has an application package for contractors to complete for inclusion on the prequalified list. The contractor provides information regarding the ownership and experience of the company. As of April 25, 2001, there were 435 contractors on the list. We reviewed the application packages for 25 of those contractors. Overall, we found the applications to be reasonably complete. All contractors must be bonded before they are permitted to bid on a contract.

We reviewed a sample of construction contracts at each of the four regional field offices. Overall, we found that the files were reasonably complete and contained the information required by the department's policies and procedures. However, a few files did not have evidence of a preconstruction meeting. The contract files which did not have preconstruction meeting notices or preconstruction meeting minutes were as follows:

Regional Field Office	Contracts Reviewed	Number Without Preconstruction Meeting Minutes	Number Without Preconstruction Meeting Notice
Region 1	25	0	0
Region 2	25	1	3
Region 3	24	4	4
Region 4	25	6	6
Total	99	11	13

The Department of Transportation's *Standard Specifications for Road and Bridge Construction* dated March 1, 1995, (Section 105 – Control of Work, Specification 105.06 Planning of the Operations – Preconstruction Conference) states that after execution of the contract and prior to beginning work, the contractor provides the department with a plan of operation for the project. Subsequent to submitting the plan, the department schedules a preconstruction meeting, which the contractor, department staff, and other entities connected with the project (i.e., utilities, county and city personnel) attend.

ROADWAY MAINTENANCE MANAGEMENT SYSTEM NOT YET COMPLETED

To address the problems of the current maintenance system, and as it indicated that it would in prior audits, the department is in the process of developing a new maintenance management system. Concerns noted in the 1986 and 1993 performance audits about control of maintenance work have not been resolved. A finding in the 1993 performance audit stated that the maintenance management system (1) could not provide the department with timely, accurate information; (2) did not allow for the direct gathering and reporting of information at the district offices; and (3) could not provide information required to produce more effective budgeting and planning. Similar problems with the department's management of maintenance operations were noted in the 1986 audit report.

The department anticipates that the new system, which is currently in the request for proposal (RFP) phase, will better enable it to track and manage operations while still allowing regional offices to move resources as needed. Specifically, the existing maintenance system is unable to track the change in resource allocation and is less able to anticipate future maintenance needs and manage resources. For example, the current system does not enable the department to evaluate programs (such as resurfacing and mowing projects) to determine whether they should be modified or eliminated and whether resources should be reallocated to other programs. Also, the system does not provide data to enable the department to assess the performance of regional maintenance operations. The current system only indicates the amount of funding spent on a particular project and does not indicate how well the project was performed. The department should establish measures to assess the efficiency of maintenance services and use the new information system to gather the needed data. Examples of efficiency measures include the average unit cost for labor, equipment, and material for road resurfacing or snow removal.

The RFP for the maintenance system was issued in April 2001 but was reissued in 2002. Department staff stated that the bids varied widely, making it difficult to accurately compare the bids. A new, more detailed RFP was sent to potential bidders at the beginning of calendar year 2002. The department estimates that the contract will be signed with the winning bidder in May 2002.

IMPROVEMENTS IN THE PAVEMENT MANAGEMENT SYSTEM

The Pavement Management System was created through the power of the commissioner granted by *Tennessee Code Annotated* Section 4-3-2303 (16) to develop a plan to establish and maintain long-term, cost-effective highway condition ratings. The Tennessee Interstate System consists of 1,073 miles of interstate, inspected annually, and 10,685 miles of state route (non-interstate routes), divided into four regions. One state route region is inspected every year. Data collected from inspections include roughness, rutting, and distress, which are converted into Pavement Roughness Index, Pavement Distress Index, and Pavement Quality Index ratings. The International Roughness Index (IRI) must be calculated from the data collected and reported to the Federal Highway Administration (FHWA) as a basis for receiving funds for highway improvements.

The goals of this system are to maintain 90% of the Interstate System and 85% of the State Route System highways in good or very good condition with no more than 10% of the interstates and 15% of the state routes in poor or very poor condition. Also, 8- and 12-year resurfacing cycles for the Interstate System, and State Route System, respectively, are the final goals of the system. The first Pavement Quality Report summarizing data from 1999 indicated that 89% of the Interstate System was in very good condition. This report also indicated that 0% are rated as very poor.

Status of Pavement Management System in 1993

A finding in the 1993 performance audit found that the department did not base its pavement condition-rating program on quantitative data and did not maintain adequate, uniform written standards. The data collected was of a subjective nature, and there was a duplication of labor because multiple groups were performing the same inspections. Beginning in July 1986, pavement was measured objectively with ARAN (Automated Road Analyzer), but the department quit using this equipment in 1989 because of its maintenance needs. The audit report discussed several options including contracting with a private firm to provide pavement condition ratings. It recommended that the department develop and implement formal written standards and procedures as well as eliminating any duplication of labor.

Status of Pavement Management System in 2001

The department has chosen to contract out highway inspection and data collection since 1995. The department contracted with Infrastructure Management Services to collect highway

data for 1999 and 2000. Currently, the department has contracted with Mandli Communications to collect highway data for 2002 and 2003. Because the work is contracted out, the department does not maintain written policies and procedures, but does stipulate what is needed and expected of contractors when petitioning bids (roughness, wheel path rut depth, distress data such as cracking and separation). These standards were taken from the *Distress Identification Manual for Long-Term Pavement Performance Project*, developed by the Strategic Highway Research Program, National Research Council. Also, there are decision criteria and measurements that aid in scheduling and prioritizing highways for resurfacing. Through the department's quality control program, an independent contractor measures one tenth of the highways measured by the primary contractor and compares the results. There is no longer a duplication of labor, except that the Maintenance Division inspects highways for asset accountability. The Maintenance Division subjectively inspects pavement, along with inspecting signs, grass, drains, etc. The subjective inspections are compared to the contracted inspections, acting as a check and balance.

The highway data mentioned above are collected objectively through the use of lasers, digital video cameras, and recording systems. The data collected from these inspections are stored in the Pavement Management System (PMS), which is a database that can generate reports that aid in analyzing the conditions of roads within Tennessee. In the past, the department received an electronic copy that would automatically upload into the PMS. However, the system has been upgraded so that the system is capable of producing the Roadway Condition Report that summarizes data collected from inspections. The PMS is also used to report IRI (International Roughness Index) information to the FHWA and update the Transportation Roadway Information Management System. Data reported to the FHWA is compiled and compared to that of the other 49 states, the District of Columbia, and Puerto Rico. The roughness of a highway is measured by the contractor using a vehicle equipped with lasers and instruments that measure the vertical deviations of the vehicle's suspension system as the vehicle travels on the highway. According to federal standards, a highway is considered smooth if the IRI is less than or equal to 80 inches per mile. If the IRI is equal to or greater than 170 inches per mile, the highway is considered to be rough. The department has decided to consider an IRI equal to or greater than 130 inches per mile to be rough. Tennessee's percentage of highways that maintain an IRI lower than 170 has been higher than 90% since 1995.

The department is considering a proposal which includes stipulations that the company maintain a Web site where the department can download information monthly or as a project is completed. This option will provide more opportunity for improved road conditions because data will be received earlier; therefore, problems with pavement have a higher probability of being identified and rectified earlier.

FINDINGS AND RECOMMENDATIONS

STRUCTURES DIVISION

1. Bridge inspections were not always conducted timely

Finding

According to the *Structures Division Procedures Manual*, the time between inspections should not be less than 22 months or greater than 27 months. A review of the two most current inspection reports in 40 randomly selected bridge inspection files (10 files from each of the four department regions) revealed that seven bridges (9%) were not inspected within the 27-month time period. Ten bridges (12.5%) were inspected less than 22 months after the last inspection date (see Table 5). While some inspections were late, others were early, increasing the workload of the inspection evaluators (see finding 2).

When bridge inspections are not conducted within a 27-month time frame, the department is not in compliance with the National Bridge Inspection Standards (NBIS). (According to the *Code of Federal Regulations* (CFR) 23-650.305, each bridge is to be inspected at regular intervals not to exceed two years in accordance with section 2.3 of the *AASHTO Manual*, but FHWA allows the department a three-month grace period.) Also, inspecting bridges sooner than the 22 months increases the number of bridge inspections that must be evaluated, thus increasing the backlog (see finding 2).

Three of the inspections (one state and two county bridges in Region 3) that occurred after 27 months were in the most current inspection reports, and four (one state bridge in Region 1, Region 3, and Region 4; and one county bridge in Region 4) were in the second most current inspection reports reviewed. The file review also identified a new problem, in that ten of the most current inspections were conducted within 22 months of the prior inspection date (see Table 5). (The most current inspections occurred between September 1998 and March 2001; the second most current occurred between August 1996 and July 1999; and the third most current inspections occurred between September 1994 and December 1996.)

The department began keeping information on past-due bridge inspections in August 1999. The August 1999 report indicated that 459 of 22,024 bridges (37 in Region 1, 384 in Region 3, and 38 in Region 4) were past-due. As of February 11, 2002, 82 of 21,926 bridges (67 in Region 1 and 15 in Region 3) were past-due for inspection. Thus, the overdue bridge inspections have decreased from 2% in 1999 to 0.4% in 2002.

According to the manager of bridge inspections, an exception report is produced each month listing bridges that have exceeded 27 months since the last inspection. This report is sent to the regional directors to inform them of the bridge inspections that are past-due according to federal standards. The problem with this report is that the bridges (at 27 months) have already exceeded the grace period and are not in compliance. It appears that it would be better to list bridges that have exceeded the 24-month period and attempt to get the inspections performed before the three-month grace period expires.

Table 5: Time Period Between Bridge Inspections*

Region	Most Current Inspection Report						Second Most Current Inspection Report					
	Less than 22 Months	Percent	22 – 27 Months	Percent	More than 27 Months	Percent	Less than 22 Months	Percent	22 - 27 Months	Percent	More than 27 Months	Percent
Region 1												
State	3	7.50%	5	12.50%					7	17.50%	1	2.50%
County			2	5.00%					2	5.00%		
City												
Region 2												
State	3	7.50%	3	7.50%					6	15.00%		
County			4	10.00%					4	10.00%		
City												
Region 3												
State	1	2.50%	5	12.50%	1	2.50%			6	15.00%	1	2.50%
County			1	2.50%	2	5.00%			3	7.50%		
City												
Region 4												
State	3	7.50%	3	7.50%					5	12.50%	1	2.50%
County			4	10.00%					3	7.50%	1	2.50%
City												
Total	**10**	**25%**	**27**	**68%**	**3**	**8%**			**36**	**90%**	**4**	**10%**

* Based on a review of 40 Bridge Inspection Files (10 from each region)

Recommendation

The department should follow policy and procedures concerning the timing of bridge inspections. The department should develop a tracking system that will produce an exception report when a bridge is not inspected within 24 months to prevent exceeding the three-month grace period allowed by the National Bridge Inspection Standards. Regional staff should monitor the number of bridges that are being completed prior to the 22-month period to prevent bridges from being inspected too early and contributing to the backlog of evaluations. The department should also send a Bridge Inspection Exception Report to the regional directors, informing them of bridges in their region that have reached 24 months since the previous inspection report date. These bridges should receive priority in scheduling so that the time period between inspection reports does not exceed 27 months.

Management's Comment

Management concurs with this finding. The recommended 24-month exception report has been developed and will be used to monitor the status of the inspection teams in each region. The issue of bridges being inspected too early, before the 22-month lower limit, is more difficult to address. This requires the cooperation of the Regional Directors and Regional Bridge Engineers. However, we have communicated the importance of staying on schedule to regional personnel and will continue to emphasize the issue as necessary.

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2. Many bridge inspection files reviewed were not evaluated in a timely manner

Finding

The audit included a file review of the three most current inspection reports in 40 bridge inspection files randomly selected from each department region (10 files from each of the four regions). The file review revealed that the department did not evaluate 63 of the 89 inspection reports (71%) within a 150-day time period. Thirty-one (25.8%) of the reports (8 of the most current, 4 of the second most current, and 19 of the third most current reports) were not located in the reviewed files. (See Table 6 for a summary of the file review.)

The bridge inspection report evaluation is performed to prepare any engineering calculations that the inspection team did not perform and to prepare summary documentation for local governments such as a Bridge-Posting Log. The evaluation also serves as a bridge inspection Quality Control. According to the *TDOT Bridge Inspection Procedures Manual*, bridge condition evaluation determines "the overall condition and load capacity of a bridge."

Table 6: Time Period Between Bridge Inspection Report and Completion of Evaluation Report*

Region	Within 150 Days	Percent	151 Days to 180 Days	Percent	Greater than 180 Days	Percent	Report Not in File	Percent
MOST CURRENT INSPECTION REPORT								
Region 1								
State	3	7.5%	3	7.5%	1	2.5%	1	2.5%
County			1	2.5%	1	2.5%		
City								
Region 2								
State	2	5.0%	1	2.5%	2	5.0%	1	2.5%
County	1	2.5%	2	5.0%	1	2.5%		
City								
Region 3								
State	1	2.5%	4	10.0%	2	5.0%	1	2.5%
County					1	2.5%	1	2.5%
City								
Region 4								
State	1	2.5%	1	2.5%			4	10.0%
County	3	7.5%			1	2.5%		
City								
TOTAL	**11**	**27.5%**	**12**	**30.0%**	**9**	**22.5%**	**8**	**20.0%**
SECOND MOST CURRENT INSPECTION REPORT								
Region 1								
State								
County	1	2.5%	3	7.5%	4	10.0%		
City	1	2.5%			1	2.5%		
Region 2								
State								
County	1	2.5%	2	5.0%	3	7.5%		
City	1	2.5%	1	2.5%	2	5.0%		
Region 3								
State								
County	5	12.5%			3	7.5%		
City					1	2.5%	1	2.5%
Region 4								
State								
County					3	7.5%	3	7.5%
City	3	7.5%			1	2.5%		
TOTAL	**12**	**30.0%**	**6**	**15.0%**	**18**	**45%**	**4**	**10.0%**
THIRD MOST CURRENT INSPECTION REPORT								
Region 1								
State					2	5.0%	6	15/0%
County							2	5.0%
City								
Region 2								
State					4	10.0%	2	5.0%
County	1	2.5%	1	2.5%	2	5.0%		
City								
Region 3								
State	1	2.5%			3	7.5%	4	10.0%
County					1	2.5%	1	2.5%
City								
Region 4								
State	1	2.5%	1	2.5%	1	2.5%	3	7.5%
County					3	7.5%	1	2.5%
City								
TOTAL	**3**	**7.5%**	**2**	**5.0%**	**16**	**40.0%**	**19**	**47.5%**
TOTAL FOR ALL REPORTS	**26**	**21.7% # 29.2% ^**	**20**	**16.7% # 22.5% ^**	**43**	**35.8% # 48.3% ^**	**31**	**25.8% #**

*Based on the review of the three most current inspection reports in 40 Bridge Inspection Files (10 from each region)

#Based on 120 reports that auditors intended to review

^Based on 89 reports that were actually found in the folders reviewed

The manager of bridge inspections indicated that, as an internal goal, the department tries to have evaluations completed within five months or 150 days of the inspection. This allows the inspection teams 90 days to prepare and send the report to Nashville. The bridge inspection evaluators in Nashville are then allowed 60 days to assemble the bridge inspection file and evaluate the report. According to National Bridge Inspection Standards (NBIS),

> Newly completed structures, modification of existing structures which would alter previously recorded data on the inventory forms or placement of load restriction signs on the approaches to or at the structure itself shall be entered into the State's inspection reports and the computer inventory file as promptly as practical, but no later than 90 days after the change in the status of the structure for bridges directly under the State's jurisdiction and no later than 180 days after the change in status of the structure for all other bridges on public roads within the State.

The review of 120 bridge inspections indicated that overall, 26 reports (21.7%) were evaluated within 150 days, 20 reports (16.7%) were evaluated between 151 to 180 days, 43 reports (35.8%) were evaluated after 180 days, and 31 reports (25.8%) were not found in the files. (See Table 6.) Thus, based on the 89 reports located, only 26 reports (29.2%) were evaluated within the 150-day time period. The number of days between the time of the inspection and the evaluation ranged from 217 (Region 4, McNairy County) to 464 (Region 1, Morgan County).

A list of past-due evaluations as of February 11, 2002, from the Tennessee Roadway Information Management System (TRIMS) indicated that 2,747 of 19,563 evaluations were past-due. This number includes 189 interstate, 981 state route, 45 city, and 1,532 county bridges. The manager indicated that the bridge inspection evaluator's priority is to review current poor/critical bridges first, then good/fair bridges on backlog, and finally current good/fair bridges. The manager stated by the time the current good/fair bridges are evaluated, they might be on the backlog list. There is a possibility that a bridge inspection report could be on the backlog list so long that it is reinspected before the prior evaluation is completed. The manager stated that the chance of this occurring is very small. However, according to the manager, in those instances, the bridge inspection report would be evaluated as soon as possible and the prior, past-due evaluation would be eliminated from the backlog list.

The bridge inspection process begins when a regional bridge inspection team decides to inspect the bridges in a particular county. The team will inspect all interstates, state routes, and city and county bridges, in that order. The actual bridge inspection might take one month. Then two months may be required to complete the report documents, batch the information, and send the information to the department's central office for evaluation. To try to prevent noncompliance with the NBIS requirements, inspection teams with the Bridge Inspection Module software are able to enter information (inspection date and bridge condition items) directly into TRIMS. The inspection teams that do not currently have the software fill out coded forms as soon as the inspection is completed and submit the information to the central office. Department staff then enter this information into TRIMS, and the inspection team completes the reports to submit for evaluation. The manager of bridge inspections indicated that the FHWA

has accepted this process as meeting the minimum requirements of posting information in TRIMS within 90 days.

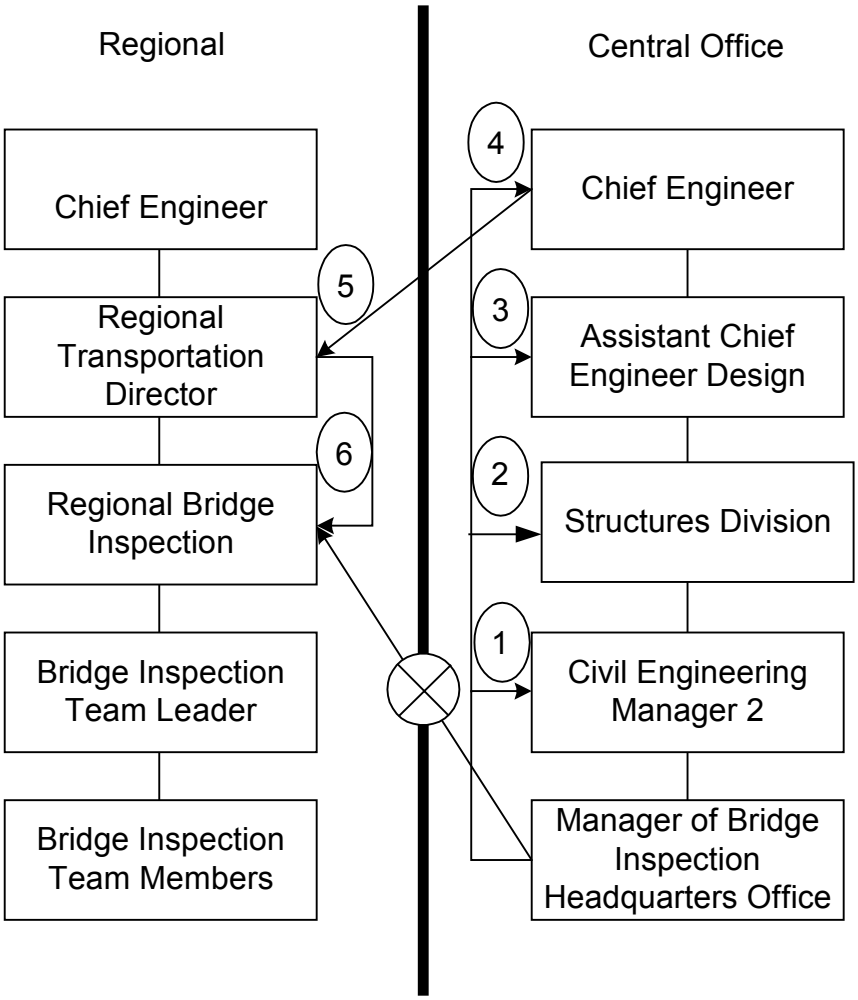
The manager of bridge inspections mentioned two factors that have contributed to the backlog of bridge inspection report evaluations. One factor is that the section only has six evaluators. An evaluation can take anywhere from five minutes to one week depending on the bridge's rating; a bridge with a poor/critical rating would take a long time to evaluate, as would a complex bridge with multiple areas. The state has 19,563 bridges that must be inspected on a two-year cycle. Thus, about 9,781 inspections are conducted annually. In calendar year 2001, the department's central office received 10,170 completed bridge inspections. The evaluators completed 10,507 evaluations, and thus 337 backlog evaluations were removed from the past-due evaluation list. The manager of bridge inspections believes that if the inspection reporting process could be performed electronically (on computer) rather than on paper forms, the increase in efficiency could reduce or eliminate the backlog of bridge inspection evaluations.

The second factor is that department policy requires that bridges be inspected between 22 to 27 months from the date of the last bridge inspection. The 22-month requirement was created for department convenience, but when the teams get ahead of schedule, it increases the number of inspections that must be evaluated. (See finding 1.) As indicated above, the inspectors can inspect about 10,000 bridges per year if they are on schedule. If the inspections were on an 18-month cycle, 13,000 inspections and evaluations would need to be conducted every year. Currently, Region 4 is on a 19-month cycle. Each of the individual regions has its own scheduling cycle for bridge inspections.

Another part of the problem is that the department's central office staff member responsible for bridge inspections does not have any authority over the regional bridge inspection teams. According to the organization chart, the Manager of the Bridge Inspection Headquarters Office only has authority to request that bridge inspection teams complete certain tasks. Requests have been made that Region 4 slow down to a 22-month cycle to help reduce the backlog of evaluations, but the region has not responded. According to the organization chart, the manager must submit his request through the following channels: Civil Engineer Manager's Supervisor, Director of Structures, Chief Engineer, Regional Director, Regional Bridge Inspector Supervisor, and Inspection Team Leader. (See Exhibit 3.)

To increase efficiency and reduce the amount of paperwork for inspectors and evaluators, the department is providing bridge inspection teams with Bridge Inspection Module software in TRIMS so they can enter data directly into TRIMS. Currently 6 of the 17 bridge inspection teams have access to the software, and all Region 2 teams are using the Bridge Inspection Module in TRIMS. The first team to use the module was Crossville in February 2001. There is also one team in Region 1 with access to TRIMS. The bridge inspection manager at the central office indicated that when the Bridge Inspection Module is fully implemented, everyone will have access to all bridge information. However, the inspection manager did not know when the module would be fully implemented. The inspectors will be able to update information immediately, including inspections and maintenance recommendations. To prevent duplications, only the Central Office will be authorized to add new bridges to TRIMS. The department is also currently working on acquiring a document management system.

Exhibit 3: Channel of Communication from Manager of Bridge Inspection Headquarters Office to Bridge Inspection Team Leaders



When evaluations are not performed in a timely manner, there is a delay in determining the proper classification of the bridge. A state, county, or city bridge might not meet the currently posted load requirements, and the bridge posting should be changed. If the evaluation is not completed in a timely manner, there is a risk that a bridge could collapse, due to overweight vehicles, because of the inaccurate bridge posting information.

Recommendation

The department should increase efforts to reduce the bridge inspection report evaluation backlog. The department should monitor the bridge inspection teams in the four regions and make sure that the teams are not inspecting bridges prior to 22 months after the last inspection. The department should give the manager of bridge inspections in the central office more direct control over the bridge inspection teams in the field. The department should also continue efforts to equip and train all inspection teams with the Bridge Inspection Module in TRIMS and implement the use of a document management system.

Management's Comment

Management concurs with this finding. The inability to reduce the backlog of bridge inspections is related to two factors. One is inadequate staffing in the bridge inspection office. Currently, only six Structural Specialist employees must evaluate over 10,000 inspection reports each year. Since one Structural Specialist is continually employed in processing overweight permit requests, we effectively only have five Structural Specialists to process the inspection reports. This level of staffing is inadequate.

A second factor is the level of information technology available to process these reports. These reports are still handled in a paper format that is very labor intensive to process.

Both issues need to be addressed. The Headquarters Bridge Inspection Office currently has a vacant Structural Specialist position. We are trying to fill this position to obtain a modest increase in staffing. We are also working with the Information Technology Office to establish a Document Management System (DMS). With an effective DMS, inspection reports can be processed electronically with a resulting increase in productivity. Taken together, we believe that these actions will help to address the current deficiency.

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3. Completion of department bridge maintenance recommendations not documented

Finding

The audit file review of 40 randomly selected bridge inspection files (10 from each of the four regions) revealed that 82% (98 of 120) of the three most current maintenance recommendation documents failed to indicate whether the inspector's maintenance recommendations were completed. (See Table 7.)

The regional bridge inspection team makes recommendations concerning any maintenance that needs to be completed. If the bridge is a state bridge, the recommendations will be forwarded to the regional bridge maintenance team. The regional bridge maintenance team will make the repairs if possible or inform the central office that the repairs need to be contracted out. If the regional bridge maintenance team completes the recommended repairs, the

regional bridge inspection team will be informed and update the information in TRIMS. If a private contractor performs the repairs, TRIMS will be updated when the department has been notified that the work is completed. The manager of bridge inspections stated that if the bridge is a city or county bridge, the regional bridge inspection team will review the maintenance recommendations with the appropriate individuals. In some instances, the city or county will inform the department that the recommended repairs have been completed and the department will update TRIMS. In most instances, the city or county will not inform the department and the regional bridge inspection team will determine if the repairs have been completed when the next scheduled inspection is conducted.

The bridge inspection reports reviewed contained a separate sheet for maintenance recommendations, which had spaces for dates and initials to indicate that the inspector's maintenance recommendations had been completed. The most recent maintenance recommendation sheets that contained dates and initials were from 1993.

Table 7: Documentation of Recommendation Reports Being Completed Inspections Conducted August 1994 Through March 2001

Maintenance Recommendations Without Initials and Date Indicating Completion of Recommendations

Region	Most Current Inspection^	Percent of Total	2nd Most Current Inspection^	Percent of Total	3rd Most Current Inspection	Percent of Total
Region 1						
State	8	20%	8	20%	6	15%
County	2	5%	2	5%	2	5%
City						
Region 2						
State	5	13%	4	10%	3	7.5%
County	4	10%	4	10%	2	5%
City						
Region 3						
State	6	15%	6	15%	6	15%
County	2	5%	2	5%	2	5%
City						
Region 4						
State	4	10%	5	12.5%	4	10%
County	4	10%	4	10%	3	8%
City						
Total	**35**	**88%**	**35**	**88%**	**28**	**70%**

^ Based on the review of the three most current inspection reports in 40 Bridge Inspection Files (10 files from each region, total of 120 inspection reports). Bridge inspections required every two years.

The department's *Bridge Inspection Procedures Manual* states that the bridge evaluators are to evaluate the bridges from the information in the inspection reports, prioritize the list of maintenance recommendations, and submit the prioritized repair list to the manager of bridge repair. The manual did not contain any procedure concerning follow-up of bridge inspections. From the files reviewed, it appears that the department does not follow up on maintenance recommendations. The file reviews also revealed that several bridges had the same recommendations year after year.

According to the manager of bridge inspections, when the Bridge Inspection Module software is distributed to all regional bridge inspection teams, data entry will be more efficient and the recommendations will be more accessible on TRIMS. (See finding 2.) Used properly, this software should make following up on recommendations easier.

Staff also indicated that the department does not keep a maintenance log, and there is no central location to determine if a particular bridge has been repaired. Without proper documentation, the state might be held liable for damages to a motorist if bridge deficiencies are identified during inspections and there was not proper documentation that the maintenance had been completed.

Recommendation

The department should require that appropriate staff initial and date the maintenance recommendation sheet to document that the recommendations have been followed or implement the Bridge Inspection Module in TRIMS for all bridge inspection teams and require that follow-up of recommendations be tracked using the module. The department should also develop a centralized bridge maintenance tracking system that follows up on the inspector's maintenance recommendations and the evaluator's prioritized recommendations to determine that the appropriate entity (state or local government) has performed the recommended maintenance or corrections. The department should document that the maintenance or correction has been performed or not been performed in the bridge inspection file. If the bridge is owned by a local government entity (county or city), the department should take appropriate actions whenever the recommendations are not performed. For example, the department has been given approval by the FHWA to withhold federal aid from local governments if the entity fails to follow NBIS standards concerning posting load requirements.

Management's Comment

Management concurs with this finding. The Headquarters Bridge Inspection Office does track maintenance actions if they are informed of them, but current levels of communication are not always adequate.

This problem can best be addressed with improved information technology. The Tennessee Roadway Information Management System (TRIMS) contains a Bridge Inspector's Module that allows regional personnel to directly update our records. Maintenance actions can

be recorded using this module. This module is not yet available to all regional inspection teams, but efforts are under way to make it readily available statewide.

The proposed Document Management System (DMS) will also aid in this regard. Detailed reports, containing photographs, sketches, etc., of the completed repairs can be input into the DMS to provide a permanent record of past repair actions.

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4. The department does not always document bridge damage inspections

Finding

When a bridge is involved in an accident, the regional office is notified by the Highway Patrol, local law enforcement, or private citizens, or it is discovered at the time of the next inspection. When the department is notified of the accident, an inspection team is sent to the accident site, but according to department staff, if the damage is minor, a damage report is not completed.

The department's *Bridge Inspection Procedures Manual* indicates that a damage report should be completed. According to the manual,

> Proper documentation of the inspection's field measurements for more refined analysis by the Headquarters Bridge Inspection and Repair office to establish or adjust interim load restrictions or follow-up procedures is required. It should include narrative descriptions, sketches, and photographs. A particular awareness of the potential for litigation must be exercised in the documentation of Damage Inspection.

An audit review of 40 randomly selected bridge inspection files (10 from each of the four regions) indicated that there was not any documentation of bridge damage inspections. However, the auditors could not determine whether a report should be present or not because the department was not able to provide a list of bridges involved in accidents over the past five years. The bridge inspection manager stated that the bridge database does not have any special fields to show whether a bridge has been involved in an accident.

Without proper documentation, the department cannot trace damages that might show up later back to the individual(s) who could be held liable for the cost of bridge repairs. A bridge could be hit numerous times and have no apparent immediate damage, but after several impacts, problems from the original accident could surface.

Recommendation

The regional office should follow department procedures for documenting the inspection of bridges following accidents. The inspection team should document the results of the

inspection, and the documentation should be kept with the bridge inspection file for future reference. The department should also maintain a central log of bridges that have been involved in accidents. This would make the information more readily available rather than having to go through every bridge inspection file to determine which bridges have been involved in accidents. The central office should monitor the regional offices to ensure inspections are properly documented and take action if it finds the inspections are not being documented.

Management's Comment

Management concurs with this finding. However, one should realize that accidents, that cause damage to bridges, are largely random events and they are difficult to predict. All such damage events represent an unusual occurrence that must, of necessity, be handled as a special project.

The Headquarters Bridge Inspection Office does maintain records on these events as they occur. However, our limited storage space prevents us from keeping these records indefinitely. Eventually, the older records are discarded. This prevents the office from maintaining a long-term "memory" of these events as paper documents.

The proposed Document Management System (DMS) should also help with this problem. If these damage inspection reports were saved to the DMS in an electronic format, there would be no need to discard the information due to limited storage. A complete record of each event could be maintained for as long as the bridge itself exists. Furthermore, the electronic reports could be indexed within DMS to allow for easy and rapid access to the information thereby allowing a "memory" of the damage history of the bridge to be indefinitely maintained.

ENVIRONMENTAL PLANNING AND PERMITS DIVISION

5. The department does not always obtain the required environmental project permits in a timely manner

Finding

A file review of 21 current construction project files (4 in Region 1, 5 in Region 2, 7 in Region 3, and 5 in Region 4) revealed that 10 of the projects (48%) did not have all of the required permits when the preconstruction conference was held with the primary contractor and subcontractors. Contractors are prohibited from performing certain work without the permits from the Tennessee Department of Environment and Conservation (TDEC), the U.S. Army Corps of Engineers (COE), and the Tennessee Valley Authority (TVA). The delay increases the cost of completing the project, and the contractor must request that additional days be added to the original contract. Thus, the cost of the highway project is more than originally contracted for, and the general public has to endure more inconvenience due to highway construction taking longer than planned.

In Region 1 (Knoxville), four of the four projects we reviewed (100%) did not have all of the required permits when the preconstruction conference was held. The delays because of permit problems in the Knoxville projects ranged from 7 to 600 days. In Region 3 (Nashville), there were three projects for which TDEC permits were issued after the preconstruction conference was held. The delays in the Nashville projects ranged from 67 to 303 days. In Region 4, the field office in McKenzie had four projects that did not have all of the required permits available when the preconstruction conference was held. The delays in the McKenzie projects ranged from 50 to 175 days. Region 2 did not have any problems with permit delays.

The first part of the permitting process is to perform a Permit Assessment. This is a fact-gathering period when Permitting staff review the project information that is available and determine if any additional information is necessary. The information should include the following:

- Roadway Plan
- Mitigation Plans
- Erosion Control Plan
- Environment Information (assessments and/or statements)
- Historical and Archeology information
- Fish and Wildlife information
- Federal Emergency Management Agency standards
- Maps

From all the information on a project, the Permitting Section determines the type of permits necessary for construction of the project. Permitting Section staff prepare application letters describing the impact that the project will have on the different areas of concern (ecology, historical, archeology, etc). Most of the permit applications go to the U.S. Army Corps of Engineers (COE) for Section 404 Permits (U.S. Clean Water Act) and Nation Wide Permits (activities include installing aids to navigation, minor discharges and dredging, wetland restoration and creation activities, and temporary construction). The Department of Transportation (DOT) also submits applications to TDEC for NPDES (National Pollutant Discharge Elimination System) permits for construction storm water runoff, Aquatic Resource Alteration Permits (ARAP), and water quality permits. If there will be large impacts, the department must provide Mitigation Plans to lessen the impact or replace wetlands at a ratio of 2:1. An impact is considered large if it affects more than 200 feet of stream (e.g., putting in culverts). An ARAP is required for any project that will cause a stream to be changed. The COE gets involved with large wetland impacts (one-fourth of an acre or more affected), and TDEC has control over wetlands that are smaller than one-fourth of an acre.

Department of Transportation Permitting Section staff stated that the section's goal is to have assessments completed nine months to one year before the project letting date. Permit

applications should be submitted six to seven months before the project letting date so that the department will have permits in hand prior to the project letting date. However, the director of the Permitting Section indicated that the section is submitting applications for permits one month before the project letting date. The time between the project letting date and the preconstruction conference is about four to eight weeks. According to the director, there are several factors that contribute to the problem of not having the project permits ready when the Preconstruction Conference is held.

The first factor that was mentioned is that the Permitting Section is understaffed. Currently, the staff includes the director, one Roadway Specialist 3, and one Roadway Specialist 2. According to the director, the section is supposed to have three Roadway Specialist 2s. The department hires staff as Graduate Transportation Associates (GTAs) (new staff go through a year of training in different divisions of the department), and GTAs are only in the Permitting section for three months. This helps some but not enough to be able to catch up the backlog of assessments.

A second factor mentioned is that the department's biologists have been understaffed. As of February 2002, the Office of Technical Studies in the Environmental Planning and Permitting Section has 7 biologists to prepare ecology reports and permit assessments. The department is contracting work out to environmental consultants to help reduce the backlog of projects that need permits. According to the director of the Permitting Section, the department is getting permit applications ready two to three months before the project letting date. The director stated that by the end of calendar year 2002, the goal is to have permit applications ready 6 to 7 months before the project letting date. The Permitting Section director indicated that the department needs to get to the point where the permitting process begins at least 18 months prior to the project letting date. The director stated that the permits should be ready when the project is advertised so bidders are aware of the environmental requirements that must be met.

The Permitting Section director indicated that a third factor is that TDEC has a problem with getting permits approved and issued in a timely manner due to a shortage of staff. According to the director, TDEC standards are to have General Permit applications processed within 30 days and the 404 Certificates and Individual ARAPs processed within 90 days. The director indicated that TDEC is not able to process the applications according to their standards. The Department of Transportation has worked out an agreement with TDEC and is funding three positions at TDEC (Division of Water Quality – Natural Resource Section) that work only with Transportation Permit Applications. The director also stated that TDOT and TDEC have a written agreement (signed by both agencies in November 2001) that states that TDEC will issue simple permits within one month of receiving the application and complex permits within three months of receiving the application.

A fourth factor, according to the Permitting Section director, is that TDEC has expanded the monitoring requirements for the NPEDS permits (Construction Storm Water Runoff). The Permitting Section has been assigned this responsibility by the department. The Permitting Section director stated that on September 30, 2001, the Department of Transportation submitted the Phase II Permit Application, which detailed the department's five-year program, but had not received a response from TDEC as of February 2002. This plan outlines the department's plan

to measure the after-project impacts on the area (especially impacts on water quality) after the project is completed.

The Permitting Section director is also responsible for responding to TDEC Notices of Violation when contractors are cited by TDEC and maintaining a database on wetland mitigation plans to determine whether 75% of the trees survive over a planned five-year period.

Recommendation

The department needs to formally evaluate the internal problems preventing it from having the required permits in hand at the time the project is released for bids. It should place its unwritten goals for completing permit assessments and applications in its policies and procedures. The department should also evaluate the cost and benefits of contracting out the Project Assessment to reduce the backlog of permit applications so that permits are acquired in a more timely manner. The department and the Tennessee Department of Environment and Conservation should continue to work together to reduce the amount of time to obtain permits after the permit application has been submitted.

Management's Comment

Management concurs with the finding and recommendation. Implementing actions in response to the recommendation is under way as noted below. The Environmental Planning & Permits Division has evaluated the internal problems associated with permit needs and has taken the steps necessary to alleviate the problem. At this point, it is a matter of allowing time for the recently instituted processes to take effect. The division, as one of its first actions, established a work process to contract for the permit assessment. We intend to utilize consultants for this work until the backlog of projects has been addressed. The department's newly instituted Program, Project and Resource Management (PPRM) system does incorporate the timeline for permit assessment and application. The department intends to continue to work closely with the Department of Environment and Conservation regarding all water quality issues.

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6. The department does not have written guidelines for determining when to prepare an environmental study for state-funded highway projects

Finding

The department's Planning Section management decides whether to prepare an environmental study for projects that receive state funding (see Appendix A). However, the department does not have any written guidelines to follow in determining when a study should be performed.

When a highway project receives federal aid, the department must follow the guidelines set out in the National Environmental Policy Act of 1969 (NEPA). NEPA requires the department to follow the guidelines set out in the *Code of Federal Regulations* (CFR) 23, Section 771. The Federal Highway Administration (FHWA) has also developed a Technical Advisory, TA6640.8A, to provide more detailed guidelines concerning how environmental studies will be conducted and how the reports are to be prepared. Planning Section management said that the department uses the CFR 23 and the Technical Advisory as departmental guidelines concerning how environmental studies are conducted and how the reports are prepared.

However, when a highway project is solely funded by state funds, the department can choose not to conduct a study or choose to prepare a technical report. The technical report includes an ecological, archeological, and/or historical study. The study results are combined for an environmental summary report. The Assistant Chief Engineer of Planning indicated that the decision is made on a project-by-project basis. There are no written policies or procedures that provide guidelines concerning which decision should be made.

Auditors contacted Department of Transportation environmental staff in Arkansas, Georgia, Kentucky, Mississippi, Missouri, and North Carolina. All of the state staff interviewed, except Kentucky, indicated that they follow NEPA guidelines for all road projects (both federally and state funded). Kentucky staff indicated that they are transitioning to using NEPA guidelines for both federally and state funded road projects.

Written policies and procedures would assist the department's staff in making decisions regarding when to prepare environmental studies for state funded projects and would serve to provide consistency in those decisions and give the public confidence that such decisions are based on clear and fair principles and processes. Without written policies, the department is open to accusations from external sources (such as the general public and federal and/or state agencies) that the department is not consistent or uniform in making decisions concerning environmental studies for state-funded projects. For example, the department was recently a party defendant in a court case involving the construction of State Route 840. An environmental group thought the department should do more to evaluate the impact of the construction. The State Supreme Court found that the project could continue.

Recommendation

The department's Planning Section should develop written policies and procedures to follow when deciding whether to prepare an environmental study for highway projects that receive only state funding. Management decisions should be based upon these policies and procedures, and when situations demand a deviation from the written policies and procedures, the occurrence should be documented and kept with the project's environmental file.

Management's Comment

Management concurs with the finding and the recommendation. However, at present, all projects that may require at least some technical studies are being developed to be eligible for Federal-aid funding, in view of our shrinking state fund revenues available for construction projects. Therefore the need for guidelines is a moot point at this time. The flowchart in the appendix remains valid, even though under present circumstances there are no major "state funded only" projects being developed. We will pursue guidelines for determining the type of environmental study to prepare. Some states comply with Federal requirements for state-funded projects under the premise that they may wish to use Federal dollars for future phases of the project. Also, many states have environmental legislation, patterned after NEPA, that require environmental documents for state-funded projects. The Department of Transportation in those states would be required to prepare NEPA documents in accordance with state law and regulation. Tennessee has no such legislation. There is no requirement, under state law, for any kind of environmental studies or documents. Therefore, we have no written state policies or procedures.

MATERIALS AND TESTS DIVISION

7. Independent assurance testing of asphalt is not conducted as required

Finding

The Division of Materials and Tests does not consistently conduct independent assurance testing of asphalt as required by the Federal Highway Administration (FHWA) and its own policies. Failing to perform the required tests limits the department's ability to ensure that materials used in roadway projects meet contract specifications. More importantly, the department's ability to ensure the highest quality and life of roadway construction intended from the project design is jeopardized. Independent assurance testing is required by FHWA regulations to ensure that work performed and materials used in federal projects conform to specifications.

Section 637.205 of the federal-aid policy guide 23 CFR 637B requires all state highway agencies to develop a quality assurance program that will ensure that the materials and workmanship incorporated into each federal-aid highway construction project are in conformity with the requirements of the approved plans and specifications, and thus ensure the service life that was intended in the project design. A state highway agency's acceptance program must include frequency guide schedules for verification sampling and testing. Quality assurance programs must include an independent assurance component that evaluates the quality control verification sampling.

Department policies and procedures are adequate to address these federal requirements, but in the case of asphalt, they are not followed consistently. Departmental policy requires that all materials be sampled and tested before being used in a project. With some exceptions,

sampling and testing are conducted in accordance with American Society for Testing and Materials (ASTM) or American Association of State Highway and Transportation Officials (AASHTO) guidelines. (See Materials and Test Standards Associations section in the Introduction.) The objectives of the department's sampling and testing procedures and policies are to establish a program that will ensure quality control of materials and construction work; to define classes of samples and tests and outline responsibilities; and to establish a schedule for sampling frequency of materials and construction work for acceptance samples and tests. Three general classes of samples and tests are required for quality control determination: acceptance, independent assurance, and verification check.

Acceptance tests: Ensure the quality of materials and workmanship during the progress of the project. Construction division inspectors perform the tests, which may consist of samples taken at the production plant, project site, or other locations. They may also include tests by manufacturers and commercial laboratories. The Materials and Tests Division uses the results of the acceptance tests and independent assurance tests as a basis for issuing a conformance certificate for federal projects. The department issues the certificate upon completion of the project and submits it to the FHWA.

Independence tests: Ensure that the acceptance test samples are properly obtained and tested. Materials and Tests Division inspectors, who do not normally have direct responsibility for acceptance testing, obtain and test these samples. Whenever possible, samples are taken at the same time and location as the acceptance samples they are being compared to.

Verification tests: Check manufacturers' or other agencies' tests results and/or certifications and verify contractors' process control testing. Materials and Tests Division inspectors test samples that are taken independently of the quality control samples. These tests, as well as acceptance and independent assurance tests, are conducted periodically throughout the life of the project based on a schedule developed by the Materials and Tests Division.

For purposes of the independent assurance tests, materials are sampled and tested for a variety of qualities. One test measures viscosity, which is a measure of thickness. The values derived from this test are compared to the results from the acceptance tests, and variations are noted. Per policies, a pre-determined range of variance is accepted. For example, if an acceptance test for viscosity of asphalt at 135 degrees resulted in a value of 1,500, the assurance test value must fall within the range determined by policy to be acceptable.

The division has established a guide for acceptable deviations. For most test results, the normal range of acceptance is up to 10% of the numerical values. When results fall within this range, no action is required. The maximum acceptable deviation is 20% of numerical values. Results falling between the 10% and 20% range require a review to verify results. Results exceeding the maximum range of 20% require corrective action. However, with the absence of independent assurance testing, these assessments and necessary corrective actions are not being made.

An audit review of 26 files of active projects using asphalt identified only three that contained documentation of independent assurance testing. All files contained adequate documentation of the initial asphalt materials tests. However, except for three files that had records of assurance tests, the files did not contain the follow-up assessments. Two project files contained two reports, and the other had only one. While the five reports document that the required tests were performed, no assessments comparing the variances in tests were made as required. The policy requires division staff to assess whether the material meets the requirements of the specification. However, in all five reports, no assessment was made. Rather, the assessor merely indicated that the testing was conducted for informational purposes only.

The results of the independent assurance and acceptance tests are essential, in that they are used as a basis for issuing a conformance certificate upon completion of a project. Under FHWA policies, acceptance of all federal-aid projects is withheld until the Materials and Tests Division submits this document. The certificate states that all materials and acceptance reports have been reviewed and all work was performed in reasonably close conformity with specifications. Any exceptions must be listed, with explanations for these deviations and actions taken to correct the deficiency.

Regional FHWA management believes that failure to conduct independent assurance testing is a serious issue. FHWA management offered reasons why independent assurance tests should be conducted and the consequences for not doing so. For instance, the tests

- are required by federal regulations,
- identify problems in materials and testing procedures,
- identify and compensate for erroneous test procedures,
- detect errors in sampling and testing, and
- tend to strengthen acceptance testing overall.

In addition, if contractors know there will be oversight, they are more likely to follow proper procedures. FHWA management emphasized that the independent assurance test is not necessarily a better test, but simply a test used to evaluate the acceptance test.

FHWA and department management indicated a lack of adequate staff may be one reason tests are not being done. Another reason may be that FHWA oversight was reduced in the Intermodal Surface Transportation Equity Act of 1991, which gave state highway agencies more responsibility for monitoring. While department management is aware that the independent assurance testing is not being done, it has not conducted a review to determine the extent of the problem. Division management believes that independent assurance testing is an important part of the federal highway program, adding that "it is a requirement, it is funded, and it should be done."

The department's Investigation Section is currently conducting an investigation, in coordination with the U.S. Department of Transportation's Office of the Inspector General and

the U.S. Attorney's Office, which involves the independent assurance testing program. At the request of the U.S. Attorney's Office, the department would not comment on the investigation.

Recommendation

The department should take steps to ensure that independent assurance sampling and testing is conducted, as mandated by federal regulations. Department management should determine why the sampling is not being done and take action to see that it is done in the future. If necessary, the Materials and Tests Division should reallocate resources to meet any personnel demands.

Management's Comment

Management concurs with the finding. A meeting will be scheduled in the near future with the Regional Materials Supervisors and the Region IA technicians to discuss the Independent Assurance Program (IAP) and the importance of the program. In addition, an updated procedure has been developed and will soon be implemented. This updated procedure will be discussed in detail at the meeting with the regional staff responsible for the IAP within their respective regions.

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8. Contractor lab qualification policies not fully implemented

Finding

The department's policies and procedures regarding the monitoring, qualification, and inspection of contractor laboratories appear adequate and adhere to AASHTO and FHWA guidelines. However, it appears the policy has not been fully implemented and has not been effectively communicated to the department's regional offices. As a result, all contractor laboratories are not being inspected as required.

Federal regulation 23 CFR 637, Quality Assurance Procedures for Construction, published in June 1995, requires all sampling and testing of highway materials for federal-aid projects on the National Highway System to be performed by qualified technicians and in qualified laboratories as of June 29, 2000. The primary objective in establishing the qualified technician program is to assure that technicians are capable of correctly performing the appropriate sampling and testing procedures. Ultimately, regulations are designed to assure that maximum quality control and superior highway materials are incorporated into finished roadway projects.

The FHWA allows state highway agencies flexibility in developing a program. While the federal government does not specifically define the term "qualified," it suggests that at a minimum, the program should include formal training of personnel on all sampling and testing

procedures, written examinations, requalification at two- to three-year intervals, and a documented process for removing personnel who perform sampling and testing incorrectly.

At the time the new regulation was issued, the department already had in place technician qualifications as defined in the department's *Standard Specifications for Road and Bridge Construction*. The certification requirements establish the minimum qualifications for personnel involved in the sampling and testing of materials for process control, acceptance, and assurance purposes. For example, subsection 501.03 requires sampling, testing, and inspection for process control of concrete at the plant to be performed by a Department of Transportation Class 2 or higher certified concrete technician.

Prior to the new federal regulation, the Materials and Tests Division's Laboratory Section would review the lab of any new contractor wishing to do business with the state, or any new lab of an existing contractor. The reviews would verify that labs had the proper equipment, including tanks and sieves, but would not test them for operability. For example, there was no determination of proper calibration of machinery. Contractors were informed of problems, but the regional labs lacked the authority to enforce the necessary corrections. Existing department policies for laboratory qualifications were not sufficient to meet the new federal regulations.

Therefore, the Materials and Tests Division developed a policy that expanded the laboratory qualification requirements. The policy was created to establish, in addition to technician and inspector certifications, minimum qualifications for field laboratories used for the control, design, acceptance, verification, and/or assurance of materials and products. For laboratories, requirements vary depending on whether they are department regional labs or contractor labs. The regional laboratories must be inspected annually by the division's central laboratory in Nashville. The regional laboratories, with cooperation from the central laboratory, are responsible for conducting and qualifying field laboratories. In addition to the annual hot mix asphalt plant, concrete plant, and aggregate-producing plant inspections conducted by the regions, all field laboratories must be inspected every two years, at a minimum, for qualification determination.

Federal regulations require that all state highway agencies have their central laboratory accredited by the AASHTO accreditation program or a comparable program approved by the FHWA. To receive AASHTO accreditation, the central lab must participate in a sampling/testing proficiency program conducted by AASHTO, and also be inspected by AASHTO every 18-24 months. Inspectors from the central lab, which also serves as the Region 3 lab, are responsible for conducting annual inspections of the other three regional labs. The purpose of the laboratory inspection program is to provide assurance that the sampling and testing equipment and procedures are reliable and repeatable.

The regional inspections are similar to and in accordance with the AASHTO program. During regional lab reviews, inspectors conduct a comprehensive assessment of equipment, checking for proper tolerances and condition of equipment. (Tolerance is the allowable range that a test result may fall within and still be considered acceptable.) The inspections include checking sieves, determining if oven and bath temperatures are at appropriate levels, and verifying machine calibrations. (Calibration refers to the modification of equipment so that it

operates within an accepted tolerance and is working properly.) The laboratories must also document all equipment calibrations, correlations, and checks to establish a permanent record. A review of files maintained in the Region 3 offices confirmed that these inspections are completed as required, and no major problems were identified.

The division's new policy established the regional labs as the responsible authority for inspecting and qualifying the contractor laboratories. The regional labs are required to conduct inspections of the contractor and material suppliers' field laboratories a minimum of every two years as part of the qualification determination to assure proper tolerances and operability; the inspections are to include a thorough review of equipment. The policy includes minimum specification requirements for individual pieces of lab equipment and appears to be thorough and comprehensive.

Based on a review of inspection files and records from the regional offices, the new regulation has not been fully implemented. The regions outside of Nashville appear confused about what the policy requires. Auditors asked management in the four regional offices to provide documentation of all contractor labs in their regions and the dates of the most recent inspection of each. None of the regions maintain a centralized database of the labs and the inspection dates and/or schedule. Only two of the four regions were able to provide a complete list of all the contractor plants/labs doing work for the state.

In Region 1 (as well as in Region 2), management understood the policy to apply only to labs doing mix design. For example, one contractor may operate three or four concrete or asphalt plants in the region; however, only one lab is responsible for designing the material mix for specification. As a result, only 16 Region 1 labs were inspected during the period February 2000 through May 2001. Management was unable to provide a complete list of the numbers of labs in the region. Management provided auditors with documentation of inspections at other labs, but they were not as comprehensive as necessary to meet the requirements of the new policy.

In Region 2, management believed the new policy was voluntary and that only those labs requesting inspections would be inspected. Regional staff sent letters to all 28 labs in Region 2 and only 5 responded, requesting an inspection. As a result, only 5 of 28 responding to the request letter sent out in spring 2000 were inspected, all in June 2000.

In June 2001, there were 42 contractor labs in Region 3 being used in state roadway projects; however, only 14 of the labs had been inspected, with all of the inspections occurring between April 16 and June 19, 2001. Region 3's plan was to split the list so that approximately half of the inspections are conducted every year. While the department's policy was effective June 2000, the inspections were not begun until Spring 2001. The inspections were comprehensive, and in all of the 14 inspections conducted, only minor infractions were reported. For example, one lab did not have an overflow drain for the water specimen container. In all cases, the contractor was notified of the problems.

Management in Region 4 provided auditors with a list of all asphalt labs in the region but could not provide information on concrete labs in Shelby County. Management and inspectors at

the Shelby County Region 4 satellite office were unaware a new inspection policy existed. In Region 4, 21 of 23 asphalt labs were inspected between June 2000 and July 2001. Of the two remaining labs, one was accepted per AASHTO certification dated May 15, 2000. For concrete labs (with the exception of those in Shelby County), all 13 labs for plants in operation were inspected during the period May 2000 through August 2001. No documentation of Shelby County concrete lab inspections was provided to auditors.

The department's plan to qualify laboratories and staff was reviewed and certified by the FHWA as meeting federal requirements in the fall of 2000. According to FHWA management, they have no concerns regarding this issue and believe the department is probably ahead of some other states, since the department was already active in inspecting concrete and asphalt testing laboratories. Based on the inspection file reviews, however, the department needs to improve its efforts to communicate policies to the regional offices.

Recommendation

The department should ensure that all contractor laboratories are inspected as required. Also, the department should ensure that all requirements of the policy are effectively communicated to regional offices and should monitor and evaluate the policy's implementation.

Management's Comment

Management concurs with the fnding. The Regional Materials and Tests Supervisors as well as Headquarters Materials and Tests staffs have discussed the need to "qualify" contractor testing laboratories used in the acceptance decision. When considering staffing limitations, the total number of labs that need to be inspected, and the time necessary to inspect each laboratory, our original implementation plan was somewhat aggressive. Our plan was to inspect "every other" lab in a given year and then establish the biennial frequency. We are making every attempt to inspect those labs used on Federal Aid projects on the National Highway System.

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9. Weaknesses exist in policies on timely submission of concrete materials for testing

Finding

The Department of Transportation does not follow its policy regarding the timely submission of concrete samples for acceptance and quality assurance testing. In addition, the policy does not have penalty provisions. As a result, the policy does not encourage contractors to submit samples in a timely manner, which may limit the department's ability to ensure consistency in sampling and testing.

In general, the policies and procedures for testing and sampling materials are adequate and adhere to FHWA regulations. One exception, however, is the Materials and Tests Division's

practice of allowing submission and testing of concrete sample cylinders within 45 days rather than the 28-day industry practice used by other states and supported by the American Association of State Highway and Transportation Officials (AASHTO) and recommended by the Federal Highway Administration (FHWA).

Concrete Cylinder Testing Process

While concrete is not used to the extent that asphalt is, it is generally used in areas that require a very high strength capability, including bridges, ramps, and areas of high truck traffic. Department of Transportation management estimated that in Tennessee, the breakdown of material used in roadway projects is 95 percent asphalt and 5 percent concrete. Section 604.16 of the department's *Standard Specifications for Road and Bridge Construction* gives the project engineer the authority to determine concrete strength by tests made during the progress of work. These tests, in turn, will be used to determine the strength of the concrete for payment purposes. Payments made to contractors for concrete failing to meet the contract-specified strength, yet considered structurally adequate to remain in place, are reduced to compensate for the loss in strength.

Concrete is approved by acceptance tests that determine if it meets certain specifications. Other materials, including asphalt, are accepted upon verifying the manufacturer's certification that they meet specifications. Concrete is tested and accepted according to a compressive strength requirement. For example, the required specification for concrete used in most roadway projects in Tennessee is generally 3,000 psi (pounds per square inch). The project contract will include specifics about the psi requirement of concrete used by the contractor during the course of construction.

Once a contractor submits a design, all materials such as rock, soils, water, and other aggregates that will make up the product itself (e.g., concrete, asphalt) are sampled prior to mixing them into the finished product. The design must produce an average compressive strength to indicate that the contract-specified strength can be obtained when the concrete or asphalt is poured during the actual project construction. This 28-day compressive strength is determined by quality control tests made during the life of the project.

The methods used in making, curing, and testing concrete for compressive strength are in accordance with AASHTO guidelines. Under the supervision of a department-certified technician, the contractor takes a wet concrete sample at the project site. The concrete is poured into cylinders measuring 16 inches high and 6 inches in diameter. A minimum of two cylinders are made for compression testing purposes, and the number may be greater depending on the amounts of concrete poured and whether the project involves a major structure such as a bridge, culvert, or retaining wall.

All concrete acceptance tests are conducted in the Materials and Tests Division's central office lab located in the department's Region 3 office. On the 28th day after pouring, the cylinders are broken on a machine that measures the compressive strength of concrete.

The 28-day industry practice for compressive tests is based primarily on studies conducted by the Portland Cement Association and the American Concrete Institute that show concrete gaining nearly all its strength at the 28-day mark. Both the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) support the 28-day practice. The department has adopted standards developed by AASHTO and the American Standards for Testing Materials (ASTM).

Department of Transportation's 45-Day Standard

While other states contacted by auditors strictly adhere to the 28-day industry practice, the department informally allows submission and testing within 45 days, in violation of the department's written policies which require submission within 28 days. When the cylinder tests below the required psi, Section 604.16 of the department's standard specifications allows 45 days for contractors to drill and submit a core sample that can substituted for that cylinder. According to Materials and Tests management, the division interprets this to also apply to the submission of concrete cylinders.

Because concrete gains strength as it ages, it is important to determine the compressive level at 28 days. According to department management, a post-45 day submission rarely occurs. A file review of project files did not identify any cylinders submitted after 45 days.

According to Materials and Tests management, when cylinders come in between 28 and 45 days, staff will communicate to the contractor that they would like to have them within 28 days. However, the cylinders are still broken and, according to management, historically test very well in psi strength. An auditor review of project files, however, did not indicate any documentation that contractors were contacted when cylinders were submitted after 28 days.

The department's policy of accepting cylinders within this time frame may raise concerns for post-28 day breaks that record in the low range of what is acceptable. Current policy is that a cylinder broken on the 45th day is considered no different than one broken on the 28th day. For example, when a cylinder broken at 45 days (at the far range of what is allowable) tests just over the required psi (i.e. 3,100 on a 3,000 psi requirement) the department's policy is to accept the cylinder.

According to department management, the current policy considers research that shows that most strength is gained within 28 days. A study entitled "Design and Control of Concrete Mixtures," produced by the Canadian Portland Cement Association (CPCA), appears to support management's claim that there is not a great difference in the strength of concrete between 28 and 50 days, and that under most conditions, there is only a 7 percent to 10 percent increase in psi strength during this period.

Department management stated that a very limited number of cylinders are submitted and tested past the 28-day period. Management suggested that late submission could be a problem with field staff or because the project location is in a remote area and hard to access.

According to Materials and Tests management, staff have discussed the issue of contractor incentives for timely submission since January 2001. A special committee proposed requiring contractors to submit cylinders within 30 days, with a financial penalty if they are late. As of February 2002, the policy had not been finalized.

Contractor Submission of Concrete Cylinders

Late submission of test materials may be the result of departmental policy that allows contractors the option of submitting concrete cylinders. Per Section 604.03 of the department's standard specifications, the contractor is responsible for making, curing, and transporting all 28-day acceptance cylinders to the central laboratory in Nashville for testing. At a contractor's request, however, the department will furnish transportation.

After receiving complaints from contractors about the department field staff's handling of cylinders, the department changed its policy in 1989 to give the contractors the option of submitting the cylinders themselves. According to department management, in doing so, the contractors could no longer complain about the handling and shipping of the cylinders; however, very few cylinders are actually shipped by contractors.

Other States' Practices

Auditors interviewed transportation materials management from five contiguous states (Alabama, Georgia, Kentucky, Missouri, and North Carolina) to determine their policies and opinions regarding the department's 45-day standard. All five states use the 28-day AASHTO-supported practice for cylinder breaking/testing. In all five states, department staff make the concrete pour and submit the cylinders to department labs for testing. One state, Kentucky, is experimenting with a pilot project where some contractors make pours and submissions, under the observation of departmental staff. Thus, management at all five agencies stated that late breaks are not an issue because cylinders are always submitted on time by departmental staff.

Federal Highway Administration View

The Federal Highway Administration (FHWA) believes that the 28-day industry practice should be followed. However, FHWA management stated that they are not very concerned with the department's 45-day policy because concrete tests in Tennessee generally test far above the required psi. FHWA management encourages the department to develop a policy that penalizes contractors for late submission.

Concrete Compressive Test File Review

Materials and Tests Division sampling and testing records support the opinions of department and FHWA management that while there may be a number of late cylinders, the recorded compressive test scores are, in the majority of cases, well above the required psi levels. Auditors reviewed files of a random selection of 29 construction projects where concrete was used, representing a total of 889 cylinder breaks/compressive tests dated from May 28, 1996 through June 15, 2001. The following table indicates the number of contracts, the number of breaks, and dates of breaks by the regional office.

Table 8
Concrete Cylinder Breaks Reviewed

Region	Number of Contracts	Number of Breaks	Dates of Breaks
1	8	180	5/28/96 to 5/21/00
2	8	134	10/21/97 to 12/12/00
3	7	238	3/27/97 to 6/15/01
4	6	337	11/29/99 to 5/31/01
Total	29	889	

Of the 889 cylinder break documents reviewed, the files for 16 breaks indicated that the cylinders had been destroyed, and the file did not contain any further information. A total of 889 files reviewed indicated that 99, representing 11 percent of the cylinders, were broken after the 28th day, but no cylinders were broken after 45 days. Of the 99 late breaks, 46 cylinders (47 percent) were broken on either the 29th or 30th day.

Table 9
Concrete Cylinder Breaks by Region and Days

Region	Number of Cylinder Breaks	Breaks Indicating Cylinder Destroyed	Breaks Within 28 Days	Number of Breaks not Meeting PSI Requirements	Breaks Later than 28 Days	Number of Breaks not Meeting PSI Requirements
1	180	7	159	3	14	0
2	134	0	108	3	26	1
3	238	9	217	0	12	0
4	337	0	290	4	47	0
Total	889	16	774	10	99	1

Of the cylinders broken within the 28th day, only 10 tested below the required psi. No indication of action taken was noted on the testing document. Three late breaks did not meet the required psi, and no action was taken. However, those breaks represent a small portion of the breaks throughout the project.

For the majority of breaks after the 28th day, the recorded psi strength was well in excess of the required psi (generally 3,000 psi). In many cases, the recorded psi was above the 4,000 level, some as high as 6,000 psi. However, there were minor exceptions noted. One 30-day break measured 3,111 psi (3,000 required for this break).

The number of breaks after 28 days appears to vary by project. One project with 82 breaks had only one occurring after 28 days, on the 29th day. Another project had 13 of 180 (7 percent) after 28 days, but they were all within 29-31 days, and in all cases the recorded psi was well above the requirement. However, for one project, 21 of 100 breaks (21 percent) were after the 28th day, and 2 were over 40 days. For another project, 33 of 131 breaks (25 percent) were after the 28th day, and 4 were at the 40th day or later.

Recommendation

The department should follow its policy requiring submission of concrete test cylinders within 28 days. In addition, the department should implement and enforce a policy that penalizes contractors who fail to submit cylinders in a timely manner.

Management's Comment

Management concurs that a small percentage of cylinders (approximately 5%) are not submitted in a timely fashion and that other measures are needed to satisfy the department that the concrete in question is properly accepted. Timely submission is in question, but safety is never compromised; however, a proposed specification is currently out for review and comments. Under this proposal, if the required strength for concrete is not submitted in a timely fashion, the contractor will be required to meet a greater strength than that specified. Should the concrete fail to meet the greater strength requirements, price reductions will be made to the concrete in question. We believe this approach will greatly encourage cylinders to be submitted within 28 days as required.

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10. No cost-benefit assessment for contracted geotechnical consultants

Finding

The Materials and Tests and Design divisions do not conduct cost-benefit assessments to determine the efficiency and other advantages of contracting with private consultants for

geotechnical investigations. Failure to make these assessments limits the department's ability to ensure it is obtaining the most efficient services at the best quality.

The primary responsibilities of the Geotechnical Section are to conduct geotechnical investigations for new roadway projects and roadway widenings, and for structural projects, including bridges and retaining walls. The purpose of the investigations is to determine the strength of soil and rock, and to identify potential problems that contractors may experience, like sinkholes and landslides, that could add to project costs.

The project engineers and geologists conduct field and laboratory tests, the results of which are used to determine the quality of the soils and whether the slope of the project is stable. If the project is a new bridge construction for example, an assessment is made on the load-carrying capabilities of the soil and rock. The Geotechnical Section produces a report for the Design and Structures divisions on these projects that offers details concerning the test results and makes recommendations on appropriate courses of action.

Up to about five years ago, the Geotechnical Section performed most of the project testing. But as the number of projects has increased, so has the amount of work contracted out to engineering firms. Geotechnical management estimated that today, as much as 50 percent of the work is contracted to private consultants. As of September 2001, the Geotechnical Section had 32 professional positions, three of which were vacant.

According to Materials and Tests management, the decision to use contracted consultants was not based on any economic considerations that could have been identified by cost-benefit assessments. Because the division lacks sufficient personnel to complete the contracts, an administrative decision was made to contract out the work rather than increasing the staff size, even though management stated that the department pays more for consultant work than if it did the work itself.

The Design Division, which coordinates with the Geotechnical Section on projects, also contracts out similar engineering services. As with Geotechnical, the Design Division has not conducted any assessments to determine the cost-benefit of using contracted consultants for roadway engineering work. Management stated that based on the current staffing level and the commitment by this administration to complete roadway projects by stated dates, the division does not have the personnel to complete the work. While no assessment has been conducted, Design management also believes it is more expensive to utilize private consultants.

Geotechnical staff are currently compiling project data that will allow cost comparisons with work performed by contracted consultants. Once the data are compiled, management will be able to determine the average per-mile roadway cost for each consultant. For example, cost comparisons can be made for coring rock and other jobs associated with projects.

In addition to economic considerations, questions have been raised regarding the quality of the work performed by contracted consultants. According to Geotechnical management, contractors have indicated they have more confidence in work conducted in-house by the department rather than by the contracted consultants. Reasons given include the staff's greater

knowledge and experience with roadway work issues. Management stated that the private firms generally do work for numerous types of projects. A consultant doing roadway work for the department may actually specialize in foundation work for office buildings, while department staff focus on roadway projects.

Recommendation

The department should conduct cost-benefit assessments prior to contracting for geotechnical consulting services for both the Design Division and the Geotechnical Section in the Materials and Tests Division to determine whether contracting is more efficient. When developing a contract, the department should ensure that necessary roadway expertise is required in the contract.

Management's Comment

Management concurs that 1) no cost benefit assessments have been conducted to determine if outsourcing geotechnical services is beneficial from a cost or quality standpoint, and 2) we concur these assessments should be conducted. Upper management has informed the Geotechnical Engineering Section on several occasions that sufficient positions are not available to conduct all geotechnical investigations by state forces. The use of consultants would be the means used to keep up with the ever-increasing project load.

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11. No formal assessments of geotechnical consultant work

Finding

The Materials and Tests Division does not have a formal policy or process to assess the quality of Geotechnical consultants' work. Information obtained from such assessments could be beneficial in identifying problem contractors and making decisions about whether to use them again in the future.

The department's Design Division, which coordinates with the Geotechnical Section in the development of roadway project designs, uses a consultant performance evaluation process that rates all Design consultants on ten performance criteria. The Geotechnical Section, however, does not formally assess its consultants. The rated criteria used for the Design consultant assessments include responsiveness, capability, preparedness, budgeting, and planning. For each criterion, consultants are ranked on scale with 4.0 being the maximum score. Scores are averaged for all criteria, and consultants are ranked from highest to lowest. All consultants used by the division are evaluated at least once per year. After the evaluation form is completed, contractors come to the division's offices to discuss the evaluation.

A report listing all scores for consultants is submitted to a consultant selection committee, which uses the ratings to make decisions regarding future use of design consultants. Consultants are chosen by a qualification-based selection process as opposed to low bid, allowing the Design Division to select consultants based on past performances.

The Geotechnical Section has established a goal of developing a formal process to assess its consultants, but according to management, has lacked adequate staff to develop the measures. Management believes the section is still in a learning process, responding to the large increase in the use of consultants in the last two years. The section has recently hired a staff member to develop an assessment instrument.

According to Geotechnical management, there have only been a couple of instances when a consultant performed in a manner that would make the section consider not using the consultant in the future. However, the section lacks a formal process to document these problems and use them in determining whether to use the consultant in the future.

In addition to the lack of a formal review process, part of the problem lies in the manner in which Geotechnical consultants are selected. For most projects, the consultant selected by the Design Division has the responsibility for selecting the Geotechnical consultant. According to Geotechnical management, the design might change before the preliminary plans are approved and the Design consultant needs flexibility in selecting a Geotechnical consultant that meets the approved design needs. The only requirement the Design consultant must adhere to is that the Geotechnical consultant has been prequalified by the Design Division. To be prequalified, consultants submit company information such as size, number of employees, college degrees held by staff, field of practice, and financial statements.

The process is different for larger, more complex jobs. For these projects, the Geotechnical Section will provide the Design consultant with a list of four or five consultants who staff believe are capable of completing the work. While there is no written requirement to do so, according to management, there is a mutual agreement that the Design consultant will select from this list.

A disadvantage in not having a formal assessment process is there is no means to document problems and remove a consultant from the prequalified list if and when a major problem does occur. As stated, for most projects, the Design consultant can choose any Geotechnical firm provided it is on the prequalified list.

Recommendation

The Materials and Tests Division's Geotechnical Section should develop a formal policy to assess the quality of work performed by consultants. The information obtained from the assessments should be used in making decisions regarding the future use of these consultants. In the interim, the section should document any problems with current consultants to ensure problems are corrected and noted for future decisions.

Management's Comment

Management concurs that 1) no formal assessments of geotechnical consultant work are being done, and that 2) it would be beneficial to conduct these assessments in a manner similar to the Design Division.

The manager of the Geotechnical Engineering Section will attempt to create and implement a Geotechnical Consultant Evaluation Program by July 1, 2002.

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12. No follow-up assessments of products

Finding

The department does not have a formal process for conducting follow-up evaluations of products used in projects. Failure to do so may limit its ability to identify problem products and remove them from the preapproved product list.

The Materials and Tests Division's Product Evaluation and Research section is primarily responsible for conducting new product evaluation. The section determines products that are acceptable for use in state projects and maintains the department's Qualified Product List (QPL). The section makes determinations on approximately 100 products annually. New products presented by manufacturers can range from patching materials to arrow boards (the trailers that have reflective lights that are used on construction sites).

The purpose of the QPL is to make available to the Construction and Maintenance Divisions a list of products that perform satisfactorily. Inclusion on the list is not considered as prior approval and does not preclude the departmental testing and approval requirements. Rather, products on the list have been evaluated and found acceptable for use, provided all testing and/or certification requirements have been met, and provided the products are used in accordance with the manufacturers' recommendations.

There are two ways in which products are accepted and added to the QPL. The division may test products in accordance with AASHTO or ASTM standards, or a similar test developed by the department. The tests are standardized, meaning a test conducted by the department would be similar to tests conducted by other state highway agencies because both groups use tests based on AASHTO and ASTM standards.

The other option is accepting the product based on the manufacturer's certification that it meets the department's specifications. Manufacturers must produce a notarized certification that the product meets specifications and is of the same formulation as products already on the list. This method is used primarily for products on which Research and Product Evaluation staff lack the capabilities to conduct tests, or for products that are not deemed significant in terms of dollar amount or their critical nature to a project. According to Research and Product Evaluation

management, this is a general practice, and the number of products approved by certification may be as high as 30 percent.

The department reserves the right to reject any product that does not demonstrate satisfactory performance in any of the tests outlined in the evaluation procedures. In addition, the department may remove any product from the list that does not perform satisfactorily under real-life conditions. The department, however, does not have a formal process to assess the performance of these products after they have been implemented into a project.

According to management, products have been removed from the list in the past. Research and Product Evaluation management, however, was unable to provide examples of products removed. Any product removal was not the result of a formal assessment; but rather a product is removed when the Construction and Maintenance Divisions have been made aware of problems with a product. The division generally becomes aware of a problem when either staff from these divisions or contractors complain. When a question or problem with a product arises, Research and Product Evaluation staff communicate the problem to the vendor, notifying the vendor that the product is being removed from the list and may be reconsidered in the future. However, there is no formal policy for this process.

While nothing is done formally at this time to follow up on new products, division management would like to develop a process to conduct long-term product evaluations. According to management, however, nothing has been developed in the past due to a lack of resources.

Recommendation

The department should develop a process to assess products after they are added to the Qualified Products List to help it identify problem products and remove them from the list. In the interim, the department should begin maintaining records on problem products.

Management's Comment

Management concurs with the finding as stated. While there is no formal follow-up on the performance of products on the department's Qualified Product List (QPL), we do usually hear about problems from our Construction and Maintenance Divisions. Removal from the QPL is possible, but in most cases, most complaints are from a single source. What we have found is that one of the regional maintenance offices may like a product, while another may state that it does not work. Our primary goal is to listen to the feedback and to determine whether a product is acceptable for use for its intended purpose if installed according to the manufacturer's recommendations. This is where a lot of judgement comes into play.

However, we do agree that a more formal process for removal of products from the QPL should be established. At one time, we were reviewing products on a three-year cycle, but due to lack of resources, dropped this program. We propose that something similar to this be developed but on a QPL list-by-list basis (some items may be reviewed yearly while others may be every

five years). A committee composed of Headquarters and Regional Materials, Construction, and Maintenance personnel will be established to draft this policy. The estimated completion date for implementation of the policy would be prior to next construction season (March 2003).

DESIGN DIVISION
See finding 10.

AERONAUTICS DIVISION

13. The department did not inspect all airports and heliports in the required time period

Finding

The Aeronautics Division is not inspecting airports and heliports annually based on an analysis of inspections performed for calendar years 1998 through 2001. According to Section 42-2-211(a), *Tennessee Code Annotated (TCA),* public-use airports may be licensed if the department is satisfied that the airport conforms to minimum standards. Section 42-2-211(b) requires the department to provide for the licensing of airports and the annual renewal of each license. Aeronautics Division staff stated that heliports are included in these inspections because Section 42-2-101(7) defines an "airport" as any area of land or water which is used, or intended for use, for the landing and taking off of aircraft. No statute specifically directs the department to inspect heliports. The Aeronautics Division currently employs two inspectors who conduct inspections of the 77 public-use airports and 93 public-use heliports.

A review of actual airport inspections performed for calendar years 1998 through 2001 revealed that inspections were not conducted annually. The auditors determined which airport inspections were past due for calendar years 1999 through 2001. There were 64 inspections that were past due less than 6 months; 5 inspections were past due 6 to 12 months; 36 inspections were past due 13 to 24 months; and 17 inspections were more than 24 months past due. This information indicates that inspections are not occurring annually as specified in Chapter 42-2-211, *TCA*, and the rules of the department, Chapter 1680-1-2-04(e). (See Table 10.) For calendar year 2001, the department noted that seven airports were considered unlicensed and the airports were working on correcting the violations, two were working on resolving licensing violations, and five were identified as having chronic licensing violations (two of the five were working on correcting violations, and three were privately owned and turned over to the department's legal section).

Table 10: Airport Inspections as of December 31, 2001

Airport	1998	1999	Past Due (Months)	2000	Past Due (Months)	2001	Past Due (Months)
Athens	February	January		July	6	May	
Bolivar	December	January	1	March	2	June	3
Tri-Cities	NR	NR		NR		NR	
Camden	March	---	>12 ^	July	28	June	
Centerville	October	---	>12 ^	---	>24	unlicensed; project under way to correct violations	
Chattanooga	NR	NR		NR		NR	
Chattanooga-Dallas Bay	March	---	>12 ^	September	30	unlicensed; project under way to correct violations	
Clarksville	January	March	2	July	4	July	
Cleveland	January	March	2	September	18	---	15
Clifton	June	---	>12 ^	February	20	April	2
Collegedale	May	---	>12 ^	September	28	---	15
Columbia/ Mt. Pleasant	January	March	2	June	3	August	2
Copperhill	March	March		---	>12	unlicensed; project under way to correct violations	
Covington	March	---	>12 ^	---	>24 ^	February	35
Crossville	October	November	1	October		---	14
Dayton	November	---	>12 ^	---	>24 ^	March	28
Dickson	November	February	3	---	>12 ^	January	23
Dyersburg	October	---	>12 ^	---	>24 ^	August	34
Eagleville	March	## No Date		June	Cannot Tell	July	1
Elizabethton	January	---	>12 ^	October	33	October	
Fayetteville	September	---	>12 ^	August	23	---	16
Gainsboro	October	---	>12 ^	September	23	February licensing violations; corrections in process	5
Gallatin	July	November	4	November		January	2
Greenville	March	April	1	---	>12 ^	May licensing violations; corrections in process	25
Halls	October	November	1	---	>12 ^	January	26
Hohenwald	February	---	>12 ^	July	29	August	1
Humbolt	September	November	2	December	1	December	
Huntington	May	---	>12 ^	August	27	November	3
Jacksboro	May	August	3	---	>12 ^	February	18
Jackson	---	November	>23	March		---	21
Jamestown	April	May	1	---	>12 ^	February	21
Jasper	November	---	>12 ^	July	20	chronic licensing violations; corrections in process	
Johnson City	June	---	>12 ^	---	>24	chronic licensing violations; privately owned; TDOT legal	

NR – Not Required, inspected by the Federal Aviation Administration

Runway closed

--- Inspection not conducted for that calendar year

^ When inspection was not conducted, auditors went to next inspection to determine total number of months

Table 10: Airport Inspections as of December 31, 2001

Airport	1998	1999	Past Due (Months)	2000	Past Due (Months)	2001	Past Due (Months)
Kingston	March	---	>12 ^	February	23	chronic license violations; privately owned; TDOT legal	
Knoxville	NR	NR		NR		NR	
Knoxville-Island	July	January		February	1	May	3
Lafayette	February	January		March	2	---	21
Lawrenceburg	January	May	4	August	3	unlicensed; project under way to correct violations	
Lebanon	March	February		May	3	July	2
Lewisburg	August	September	1	---	>12 ^	March	18
Lexington	March	---	>12 ^	February	23	March	1
Linden	February	May	3	July	2	November	4
Livingston	February	February		---	>12 ^	February	24
Madisonville	February	---	>12 ^	June	28	October	4
McKinnon	February	May	3	January		November	10
McMinnville	April	April		March		May	2
Memphis	NR	NR		NR		NR	
Memphis-DeWitt Spain	---	---	>24 +	September	33 +	December	3
Millington-Baker	---	---	>24 +	Sept	33 +	December	3
Millington Muni	September	September		Sept		December	3
Morristown	February	---	>12 ^	---	>24 ^	May	39
Mountain City	January	July	6	---	>12 ^	May	22
Murfreesboro	March	June	3 months	March		March	
Nashville	NR	NR		NR		NR	
Nashville-Fort	November	---	>12 ^	March	16	chronic license violations; privately owned; corrections in process	
Nashville-Tune	---	April	>16	January		April	3
New Tazewell	April	March		---	>12 ^	May	26
Oneida	November	---	>12 ^	October	23	---	14
Paris	June	---	>12 ^	July	25	June	
Parsons	September	October	1	February	4	March	1
Portland	June	June		November	5	January	
Powell	April	---	>12 ^	February	22	chronic license violations; privately owned; TDOT legal	
Pulaski	February	---	>12 ^	June	28	October	4
Rockwood	February	---	>12 ^	February	24	March	1
Rogersville	April	August	4	---	>12 ^	April	20
Rossville	---	October	>22	September		---	15
Savannah	January	June	5	August	2	July	
Selmer	January	June	5	---	>12 ^	April	22
Sevierville	March	May	2	June	1	May	

NR – Not Required, inspected by the Federal Aviation Administration

--- Inspection not conducted for that calendar year

^ When inspection was not conducted, auditors went to next inspection to determine total number of months

+An inspection was not conducted in calendar year 1998 or 1999, and the auditors assigned 24 months to begin calculation. The number of months would more than likely be greater than 24 months in calendar year 1999.

Table 10: Airport Inspections as of December 31, 2001

Airport	1998	1999	Past Due (Months)	2000	Past Due (Months)	2001	Past Due (Months)
Sewanee	March	November	8	---	>12	unlicensed; project under way to correct violations	
Shelbyville	July	July		August	1	February	
Smithville	November	November		October		October	
Smyrna	July	---	>12 ^	April	21	not required	
Somerville	March	---	>12 ^	June	27	June	
Sparta	September	November	2	---	>12 ^	March	16
Springfield	June	June		July		July	
Tiptonville-Reelfoot	April	July	3	---	>12	unlicensed; project underway to correct violations	
Trenton	---	May	>17	July	2	November	4
Tullahoma	April	April		April		July	3
Union City	August	Sept	1	August		August	
Waverly	July	May		July	2	November	4
Winchester	February	November	9	October		unlicensed; project under way to correct violations	

---Inspection not conducted for that calendar year

^ When inspection was not conducted, auditors went to next inspection to determine total number of months

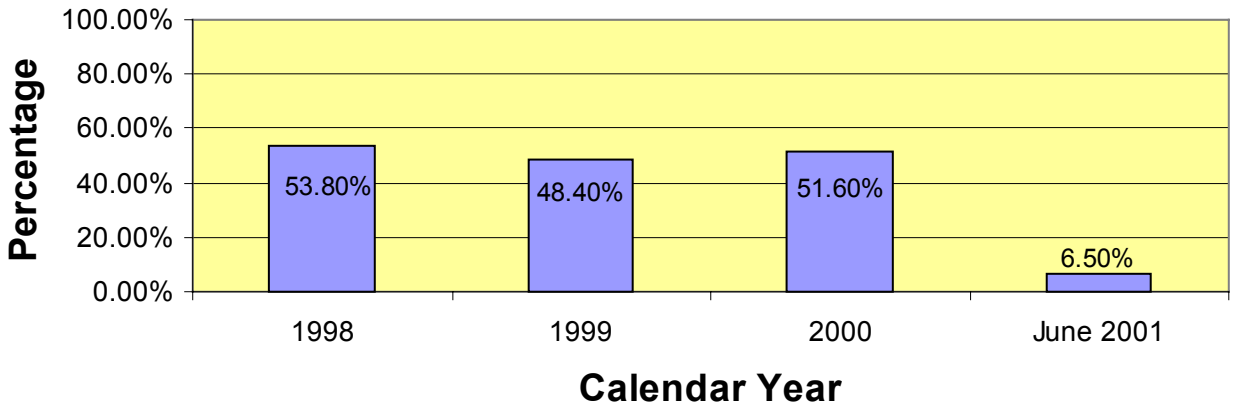
The extension of expiration dates has contributed to a backlog of inspections. In an interview, the director stated that if an inspection did not occur within a 12-month period, the license would be continued until such an inspection has been conducted. Additionally, the department does not prioritize inspections if they are missed.

The Aeronautics Division Lead Aviation Planner and both inspectors revealed that there was an extended period (almost eight months) when there was only one inspector. When the second position was filled, the new inspector had to go through about four months of on-the-job training before being able to conduct inspections alone. The period when there was only one inspector caused the initial backlog to begin, but the backlog was compounded with the acceptance of a contract with the Federal Aviation Administration (FAA) 5010 Master Record Program to inspect specific airports. (The Aeronautics Division entered into the contract because of the additional federal funding that would result.) The FAA required the state to inspect these facilities and required reinspection if the airport had already been inspected for the state requirements. The FAA contended that this information was outdated. Inspectors commented that this requirement was a problem because the contract period, which is generally 90 days, did not begin at the start of the calendar year. Therefore, inspectors could not schedule inspections according to the contract, causing them to duplicate several inspections and adding to the backlog.

A review of heliport inspections for calendar years 1998 through June 2001 indicated that the average number of heliports inspected each year ranged from 48.4% to 53.8% for calendar years 1998 through 2000. Only 6.5% of the heliports had been inspected between January 2001 and June 2001. (See Exhibit 4.) The most current inspection heliport dates ranged from 1993 to

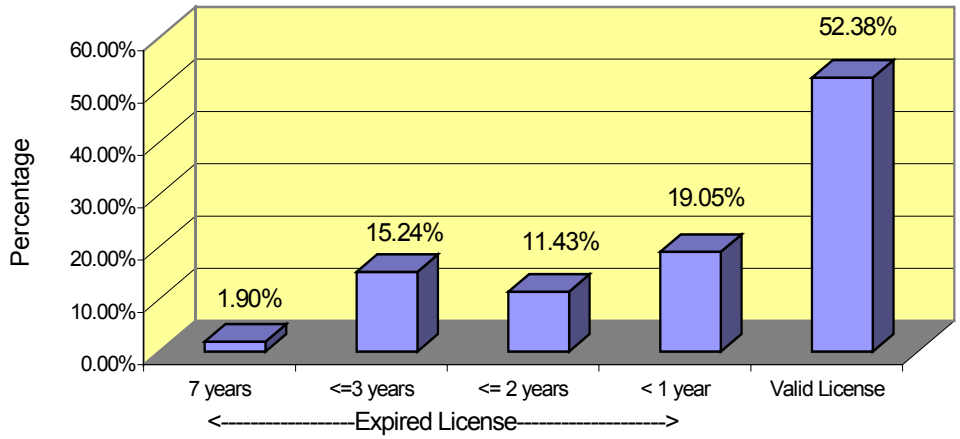
2001, and expiration dates ranged from 1994 to 2002. (See Exhibit 5.) Based on this information, approximately 48% of heliports have licenses ranging from one month to seven years past expiration.

Exhibit 4: Percentage of Heliports Inspected for the Years 1998 - June 2001 (Based on Total of 93 Heliports)



The Aeronautics Division inspectors indicated that there is not a hazard if an airport or heliport is not inspected annually. Even if an airport or heliport is not inspected in the allotted time, the Aeronautics Division still has contact with the facilities through its engineers who visit them to provide technical assistance on grant projects. If the engineers notice problems, they will contact the inspectors. According to the division, the biggest hazard would be the possibility of obstructions (generally trees), and the inspectors should have noted this on the last inspection. The inspectors also indicated that most of the heliports are for medical facilities, and these facilities keep the heliports well maintained. Accordingly, the Aeronautics Commission approved changes to its policy to allow an on-site inspection to receive a license and then to require each facility to complete a license application form and facility compliance survey form every year. Following review and approval of the information provided, the division would either issue a license renewal seal or take follow-up action with the facility to ensure compliance. Heliports would also be subject to spot checks. This change would allow the inspectors more time to inspect the airports annually. As of March 2002, the draft policy was awaiting approval by the commissioner.

Exhibit 5 : Percentage of Heliports With Expired and Valid License
As of June 30, 2001
(Based on 93 Heliports)



Recommendation

The department should follow statute and department policy by inspecting airports and heliports timely. The Aeronautics Division should develop an inspection schedule that emphasizes bringing all inspections current.

Management's Comment

Management concurs with the finding. The Aeronautics Division has instituted a program that will comply with auditors' recommendations. We do wish to emphasize that the airport and heliport inspection staff is relatively new to the program. As noted in the finding, there was a period of time when there was only one inspector handling all 77 airport and 93 heliport re-licensing inspections. This person also coordinated the new facility requests and other airport related paperwork, including completing the FAA 5010 Airport Safety Data Inspection contract.

The airport and heliport inspections have always been regarded as important, but understaffed in terms of manpower. The manpower vs. workload issue associated with the airport and heliport inspection process has resulted in at least two staff members resigning over the last five years. While seemingly insignificant in terms of overall departmental manpower, the effect upon a small staff such as the Aeronautics Division has been significant.

The Aeronautics Division is responding to the issue by aggressively attacking the problem. The addition of a second inspector is improving the situation, and a new initiative regarding heliport re-licensing will further improve the situation. An airport inspection schedule

has been established for annual re-inspection of those facilities. A copy of the schedule is available for review.

The heliport re-licensing effort was hampered by a delay in determining the exact method by which re-licensing could be accomplished. The revised procedure has now been approved by the Commissioner.

The division has reviewed its participation in the FAA 5010 Airport Safety Data program and has elected not to contract to collect this information at the current time. This is being done in part to allow staff members the opportunity to correct re-licensing shortfalls and to provide adequate time for additional airport/heliport inspection training.

CIVIL RIGHTS OFFICE

14. The department recertified Disadvantaged Business Enterprise vendors without documenting financial information

Finding

A review of 25 Disadvantaged Business Enterprise (DBE) vendor files revealed that vendors did not always comply with recertification requirements. The vendors' Personal Financial Statements (PFS) submitted for recertification as a DBE were consistently missing supporting documentation. Without supporting documentation, the DBE program staff cannot determine the accuracy of Personal Net Worth (PNW) figures. In spite of missing documentation, DBE staff recertified the 25 vendors' DBE status.

According to the Small Business Development office (SBD), as of February 2002 there were 290 certified Disadvantaged Business Enterprises. A business is certified as a DBE for a period of two years.

Federal Requirements and State Certification

To certify a vendor under the DBE program, the department is required to follow 49 CFR, Part 26, regulations of the U.S. Department of Transportation (U.S. DOT). The following are the six federal provisions for DBE eligibility:

- The DBE must be an existing "for profit" business that is operational.
- The DBE must meet the federal definition of "socially and economically disadvantaged."
- The DBE must have the expertise and authority to control daily operations and management of the firm.

- The owners of the DBE must have at least 51% ownership of the business through real and substantial capital investments.
- The DBE owners must not possess a personal net worth of more than $750,000.
- An entity must be a small business as defined by Small Business Administration (SBA) standards, as found in 13 CFR, Part 121.

To ensure that the federal eligibility provisions for the DBE program are being met, the Small Business Development office includes a "Certification Request Checklist" as a part of the application and requires that DBEs provide the office with the following items:

- Work histories of all owners
- Verification of start-up investment capital
- List of company-owned equipment and its estimated dollar value
- Lease agreements
- Proof of citizenship
- Year-to-date personal financial statements on each owner
- Notarized statement of personal net worth for each owner (every line must be completed, and supporting documents must be submitted for the items listed)
- Prior two years' personal federal tax returns (signed and dated) for each owner
- Current (year-to-date) financial statements on the business (prepared by an independent CPA or accountant)
- Copies of the three largest contracts/invoices and the two most recent contracts/invoices
- Copy of the Small Business Administration 8a affidavit
- Articles of Incorporation and bylaws (if incorporated or partnership documents)
- Payroll information for the past nine months
- Bank resolution for company checking and/or savings account
- A notarized certification affidavit basically assuring against any fraudulent act

Assuming an entity meets the federal requirements and provides the Small Business Development office with the requested documents, the compliance officer initiates a request to the office director for certification approval or denial. If approved, the director sends the DBE a letter of certification along with a certificate signed by the director and commissioner. If denied, the reason for the denial is provided, with a citation to the federal regulation supporting the office's position. During the recertification review, the department should deny continued DBE status to any vendor that exceeds the $750,000 PNW threshold or the $16.6 million average annual gross receipts threshold. Such measures are designed to prevent the continued participation of vendors who no longer qualify for DBE status.

DBE File Review Results

A review of 25 judgmentally selected DBE vendor files revealed that none of the files contained supporting documentation for Personal Net Worth and Personal Financial Statements. However, in each case, the department's Small Business Development office recertified the DBE. (See Table 11 for a list of missing documentation.) Unless DBE vendors are monitored more closely, the SBD risks certifying and recertifying vendors who are not in compliance with department policies and federal regulations and may prevent legitimate DBEs from being certified and receiving the benefits of being a DBE.

The director and compliance officer stated that insufficient staff could be one reason DBEs were certified without proper documentation. (The compliance officer is the only person responsible for recertification.) They also stated that in fiscal year 2000, 19 DBEs (7.6%) were dropped from the roster because their personal net worth exceeded $750,000.

The office needs policies and procedures for monitoring the submission of documentation, assessing financial information, and taking action for noncompliance. Vendors were recertified despite the condition of their PFS documents. The SBD staff needs an objective and standardized way to determine whether DBE vendors are exceeding the $750,000 ceiling. Vendors should be required to submit supporting documentation for all completed PFS forms. Certification should not be the reward for noncompliance.

Table 11: Results of DBE Vendor File Review of Recertified DBE Vendors

Number of Instances	Documentation of Personal Financial Statement (PFS) Available to Support Personal Net Worth (PNW) Information	Recertification Decision
1	Bank statement needed to support cash balance; mortgage papers needed.	DBE Recertified
2	All PNW line items are not supported with documentation; PFS document is missing for one owner.	DBE Recertified
1	PNW figures for the same date do not agree; document support is missing.	DBE Recertified
19	All PNW line items are not supported with documentation.	DBE Recertified
1	Completed PFS document was not in folder, and a PNW figure is not supported.	DBE Recertified
1	PFS document incomplete. PNW not supported by PFS document.	DBE Recertified

Recommendation

The Small Business Development office should require DBEs to submit supporting documentation for all completed PFS forms. Also, the Small Business Development office should institute the appropriate standards and monitoring procedures to consistently identify noncompliance. Finally, the department should assess staffing capabilities to determine whether the office has the appropriate number and type of staff to review financial information and should determine how it can employ other measures to compensate for lack of staff.

Management's Comment

Management concurs with the finding. As one of the corrective actions, the Civil Rights Division will stress again in the re-certification letters sent to the DBEs the importance of providing documentation with the Proposal For Service. The division will provide examples for them if needed, such as bank statements, meeting minutes, etc. The division will stress the need for completeness of the PFS and emphasize that failure to adhere could cause them to lose their certification.

The Civil Rights Division will continue to enlist the aid of the audit staff in the department to assist with complex financial information submitted, make the division aware of any information that has been overlooked, and to inform the division of any new or revised requirements.

The division remains understaffed in the certification area. We are currently going through the interview process to hire another Contract Compliance Officer II. Once this person is employed, we feel that the lack of oversight that occurred will be corrected. The position should be filled within 30 to 60 days.

MAINTENANCE DIVISION

15. The department is not evaluating the cost-effectiveness of contracting maintenance work as required by state law

Finding

The Department of Transportation uses both in-house staff and private vendors to perform maintenance services for state highways. In fiscal year 2001, the department spent $73,890,202 on maintenance performed by in-house staff and $59,013,768 on maintenance provided by private contractors. To help ensure maintenance services are performed in the most efficient manner, Section 4-3-2303(15), *Tennessee Code Annotated*, requires the department to document and evaluate the cost-effectiveness of contracting maintenance work with private vendors.

Department staff report that the department does not have a formalized process to assess the most efficient method of providing maintenance. However, certain factors are considered: the type of service, how soon it must be available, and cost. Routine services such as grass mowing, line striping, and litter removal are contracted. Emergency services are often kept in-house. For example department staff repair road signs because the repairs must be done quickly to eliminate safety hazards. Snow removal is done in-house, although the department may also contract with private vendors to assist department staff during an emergency. Department staff believe that the Management Maintenance System being developed will provide better cost data to use in evaluating the cost-effectiveness of contracting with private vendors. (See Observation and Comment on the Roadway Maintenance System) The lack of a formal assessment method affects the department's ability to determine the most efficient means of receiving maintenance services.

Recommendation

To ensure that the state receives the most efficient service available and to comply with state law, the department should establish a formal method of evaluating the cost-effectiveness of contracting maintenance work with private vendors. Department management should establish responsibility within the department for developing a cost-effectiveness model and monitor to see that it is developed, taking action if any problems occur.

Management's Comment

Management concurs with the finding. The department is in the process of awarding a contract for a Maintenance Management System (MMS). One of the system requirements is a cost comparison for contract vs. state work. This new system should provide us sufficient data to make an evaluation of cost-effectiveness for operational methods. The MMS proposal stated a maximum time period of three years to develop the integrated system; however, many proposals provided an 18-month time schedule for complete implementation.

PROGRAM DEVELOPMENT AND ADMINISTRATION DIVISION

16. The department could not determine the amount of time spent for the planning and design phases of some projects

Finding

The department does not have a system that records the planning and design time for all construction projects. Because of this, the department cannot determine whether it is meeting its goal to decrease the amount of time a project takes from conception to completion.

The department contracted with PricewaterhouseCoopers in 1997 to conduct an assessment of the department's operations titled *Business Process Reengineering (BPR)*. The commissioner believed processes needed revising, for one reason, because projects were taking up to 12 years to complete. One BPR goal was to reengineer the department's process to decrease that time to five or six years.

We reviewed a random sample of 99 construction contracts (see Observations and Comments, Review of Construction Project Files). The Construction Division was able to provide a start date and ending date for all 99 contracts. Of the 99 contracts, 41 were maintenance contracts such as mowing, sign refurbishment, sweeping, etc., that would not have planning and design time. For the 58 remaining contracts, we requested from the department the date planning started, the date planning was completed, the date project design began, and the date project design was completed. Department staff indicated that the information was not readily available and would take some time to research. The department was eventually able to provide all four dates for 40 of the 58 contracts. According to department staff, project tracking for planning and design time is not available; however, staff said the department is developing a system that would be able to better track project status. Staff also indicated that it will take several years for the department to have it in place.

Recommendation

The department should implement a system to track the amount of planning and design time for each project. Without such a system in place, the department will not be able to determine whether it is meeting its goal to reduce total project time.

Management's Comment

Management concurs with the finding.

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17. The department has not updated the Long-Range Transportation Plan as required by statute

Finding

The department has not updated its long-range transportation plan since September 1994. According to Section 4-3-2303(13), *Tennessee Code Annotated*, the department shall

> prepare and report to the General Assembly a long range and coordinated statewide transportation plan with specific plans, goals, and performance criteria for all transportation modes, including state controlled bridges and highway improvements which upon adoption shall be revised and submitted every two (2) years, or more frequently as the commissioner may determine, and which shall be

the basis for funding recommendations by the commissioner and for expenditures by the department.

It is important to update the long-range plan because changes could affect the state's long-term transportation needs and the department's and legislature's actions to address those needs. Over the years, many transportation-related changes have occurred. Growth in highway miles, increases in tax rates, additions of road programs, and new statutes and regulations are all changes that can make a plan outdated and obsolete.

Although there has been no increase to the 20% tax rate on gasoline since 1989 and state highways have only increased by 252 miles—from 13,553 in 1991 to 13,805 in 2001 (a 2% increase), it is no less important to update the long-range plan every two years as required.

The 1986 Road Program established new department funding and construction priorities. The Intermodal Surface Transportation Efficiency Act of 1992 provided increased federal transportation funds for states and local entities. The act also enlarged the role of metropolitan planning organizations and local governments in determining how these funds will be spent. The effect of the approval or disapproval of this plan should have been evaluated and communicated in an updated plan.

With maintenance and upkeep of all 13,805 miles of state highway being the responsibility of the department, it is very important to constantly reevaluate the wear and tear that is put on the roads yearly. Priorities have to be established, as well as forecasted, in order to make sure that money is spent when and where necessary on road improvements. With revenues and funding never being enough to take care of every problem and priorities changing at times, it becomes even more important to lay out and continue to look into the most needy areas.

It is difficult to define, quantify, and achieve long-range department goals and objectives when actual mileage under state jurisdiction; assumptions; and information about revenues, new programs, and relevant laws and regulations are not updated on a regular basis. Department staff stated that a consulting firm was hired in January 2002 to put together a 20-year long-range plan for the department. Once the department and the consultant agree on the cost of developing the plan, the department expects the plan to be completed within two years.

Recommendation

The department should update the long-range Statewide Transportation Plan at least every two years to comply with state law and to identify the best means to achieve the department's long-range goals and objectives. The commissioner should assign responsibility for monitoring the consultant's progress and the development of the long-range plan.

Management's Comment

Management concurs with the finding. The department is in the process of awarding a contract for development of a Long Range Transportation Plan. Phase 1 is scheduled to begin in May or June and will define the scope of the overall planning process. This will be completed in approximately six months. Phase 2, which provides for the development of a 25-Year Long Range Plan, will require approximately 18 months to complete. In two years, the department will have an updated plan and a process in place to monitor and modify the plan on a regular basis.

RECOMMENDATIONS

ADMINISTRATIVE

The following areas should be addressed to improve the efficiency and effectiveness of the Department of Transportation's operations.

1. The department should follow policy and procedures concerning the timing of bridge inspections. The department should develop a tracking system that will produce an exception report when a bridge is not inspected within 24 months to prevent exceeding the three-month grace period allowed by the National Bridge Inspection Standards. Regional staff should monitor the number of bridges that are being completed prior to the 22-month period to prevent bridges from being inspected too early and contributing to the backlog of evaluations. The department should also send a Bridge Inspection Exception Report to the regional directors, informing them of bridges in their region that have reached 24 months since the previous inspection report date. These bridges should receive priority in scheduling so that the time period between inspection reports does not exceed 27 months.

2. The department should increase efforts to reduce the bridge inspection report evaluation backlog. The department should monitor the bridge inspection teams in the four regions and make sure that the teams are not inspecting bridges prior to 22 months after the last inspection. In addition, the department should give the manager of bridge inspections in the central office more direct control over the bridge inspection teams in the field. The department should also continue efforts to equip and train all inspection teams with the Bridge Inspection Module in TRIMS and implement the use of a document management system.

3. The department should require that appropriate staff initial and date the maintenance recommendation sheet to document that the recommendations have been followed or implement the Bridge Inspection Module in TRIMS for all bridge inspection teams and require that follow-up of recommendations be tracked using the module. To determine that the appropriate entity (state or local government) has performed the recommended maintenance or corrections, the department should also develop a centralized bridge maintenance tracking system that follows up on the inspector's maintenance recommendations and the evaluator's prioritized recommendations. The department should document that the maintenance or correction has been performed or not been performed in the bridge inspection file. If the bridge is owned by a local government entity (county or city), the department should take appropriate actions whenever the recommendations are not performed. For example, the department has been given approval by the FHWA to withhold federal aid from local governments if the entity fails to follow NBIS standards concerning posting load requirements.

4. The regional offices should follow department procedures for documenting the inspection of bridges following accidents. The inspection team should document the results of the inspection, and the documentation should be kept with the bridge inspection file for future reference. The department should also maintain a central log of bridges that have been involved in accidents. This would make the information more readily available rather than having to go through every bridge inspection file to determine which bridges have been involved in accidents. The central office should monitor the regional offices to ensure inspections are properly documented and take action if it finds the inspections are not being documented.

5. The department needs to formally evaluate the internal problems preventing it from having the required permits in hand at the time a project is released for bids. It should place its unwritten goals for completing permit assessments and applications in its policies and procedures. The department should also evaluate the cost and benefits of contracting out the Project Assessment to reduce the backlog of permit applications so that permits are acquired in a more timely manner. The department and the Tennessee Department of Environment and Conservation should continue to work together to reduce the amount of time to obtain permits after the permit application has been submitted.

6. The department's Planning Section should develop written policies and procedures to follow when deciding whether to prepare an environmental study for highway projects that receive only state funding. Management decisions should be based upon these policies and procedures, and when situations demand a deviation from the written policies and procedures, the occurrence should be documented and kept with the project's environmental file.

7. The department should take steps to ensure that independent assurance sampling and testing is conducted, as mandated by federal regulations. Department management should determine why the sampling is not being done and take action to see that it is done in the future. If necessary, the Materials and Tests Division should reallocate resources to meet any personnel demands.

8. The department should ensure that all contractor laboratories are inspected as required. Also, the department should ensure that all requirements of the policy are effectively communicated to regional offices and should monitor and evaluate the policy's implementation.

9. The department should follow its policy requiring submission of concrete test cylinders within 28 days. In addition, the department should implement and enforce a policy that penalizes contractors who fail to submit cylinders in a timely manner.

10. The department should conduct cost-benefit assessments prior to contracting for geotechnical consulting services for both the Design Division and the Geotechnical Section in the Materials and Tests Division to determine whether contracting is more efficient. When developing a contract, the department should ensure that necessary roadway expertise is required in the contract.

11. The Materials and Tests Division's Geotechnical Section should develop a formal policy to assess the quality of work performed by consultants. The information obtained from the assessments should be used in making decisions regarding the future use of these consultants. In the interim, the section should document any problems with current consultants to ensure problems are corrected and noted for future decisions.

12. The department should develop a process to assess products after they are added to the Qualified Products List to help it identify problem products and remove them from the list. In the interim, the department should begin maintaining records on problem products.

13. The department should follow statute and department policy by inspecting airports and heliports timely. The Aeronautics Division should develop an inspection schedule that emphasizes bringing all inspections current.

14. The Small Business Development office should require DBEs to submit supporting documentation for all completed PFS forms. Also, the Small Business Development office should institute the appropriate standards and monitoring procedures to consistently identify noncompliance. Finally, the department should assess staffing capabilities to determine whether the office has the appropriate number and type of staff to review financial information and should determine how it can employ other measures to compensate for lack of staff.

15. To ensure that the state receives the most efficient service available and to comply with state law, the department should establish a formal method of evaluating the cost-effectiveness of contracting maintenance work with private vendors. Department management should establish responsibility within the department for developing a cost-effectiveness model and monitor to see that it is developed, taking action if any problems occur.

16. The department should implement a system to track the amount of planning and design time for each project. Without such a system in place, the department will not be able to determine whether it is meeting its goal to reduce total project time.

17. The department should update the long-range Statewide Transportation Plan at least every two years to comply with state law and to identify the best means to achieve the department's long-range goals and objectives. The commissioner should assign responsibility for monitoring the consultant's progress and the development of the long-range plan.

APPENDIX A

Environmental Study Process and Monitoring of Environmental Controls

Initial Process of Preparing Environmental Study

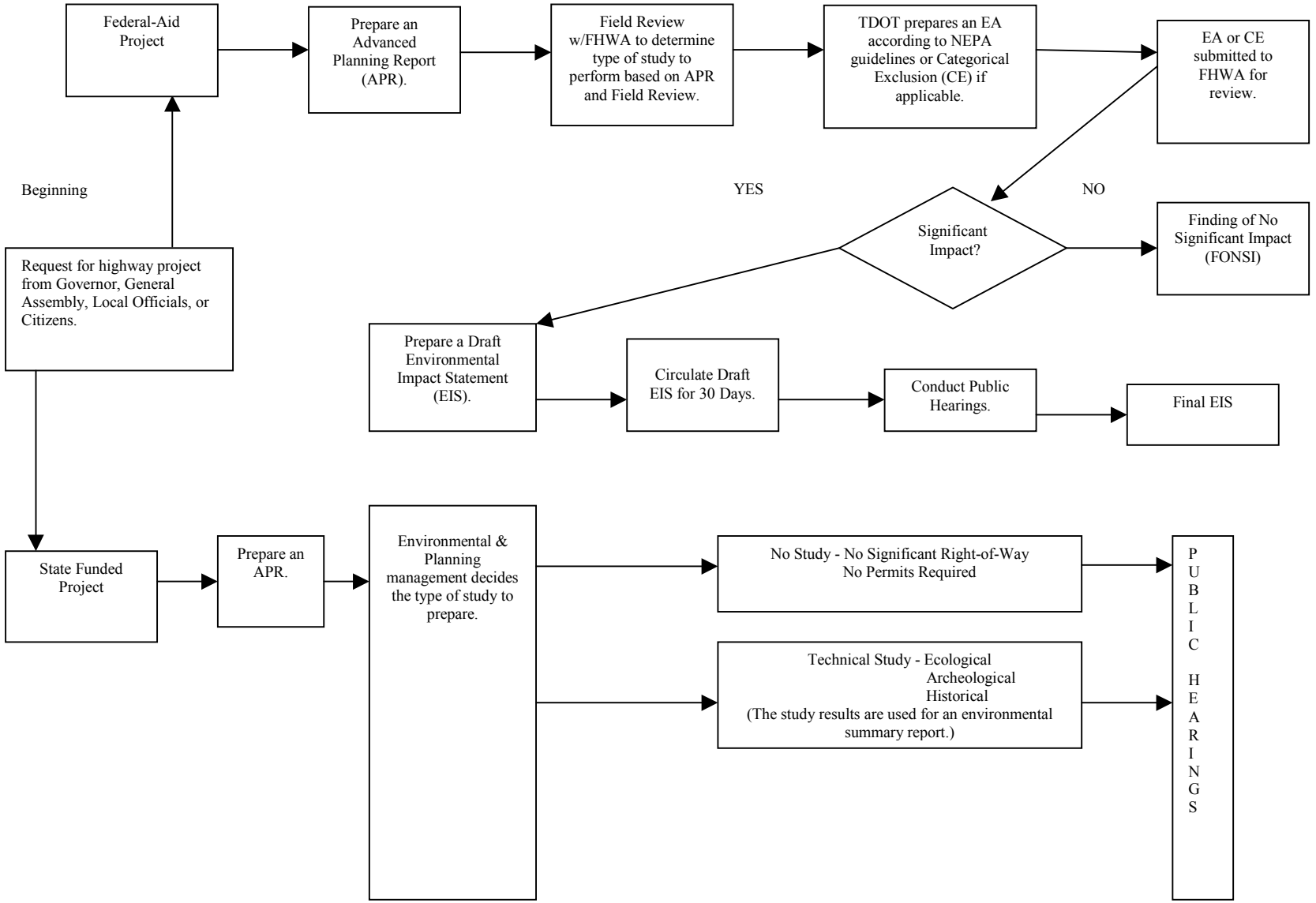
The proposal to initiate a particular highway construction project (whether the project is for new construction or modification of an existing highway) begins with a project proposal. The proposal might come from the Governor, the General Assembly, local elected officials, or concerned citizens. Normally, the process begins with a Feasibility Study to consider the cost and scope of the project. Then the Department of Transportation Planning Section will prepare an Advanced Planning Report (APR). The APR will consider the logical termini (beginning point and ending point of the project), define the section, define the cost, include a Preliminary Environmental Study (to determine possibility of archeological and/or historical sites, wildlife, etc.), and contain aerial photographs of the area.

The Environmental and Planning (EP) section will take the preliminary information from the APR and review the project in the field. The department will then decide what type of report should be prepared. (See Exhibit 6.) The department might decide to do a Categorical Exclusion, which is allowed when actions do not individually or cumulatively have a significant social, economic, or environmental effect. In these situations, the department would be excluded from the requirement to prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS). A specific list of Categorical Exclusions normally not requiring an EA or EIS is set forth in *Code of Federal Regulations* 23 771.117(c) and (d). Examples include activities which do not lead directly to construction, such as planning and technical studies; construction of bicycle and pedestrian lanes, paths, and facilities; installation of noise barriers; landscaping; and emergency repairs under 23 U.S.C. 125. More complex projects require more information in a formal submission from the state so that the FHWA division office can conclude that the project will not cause a significant environmental impact.

If the project receives federal aid, the department is required to prepare an EA when there is uncertainty as to the significance of the impacts of the project. The EA should discuss in detail only those areas where there is potential for a significant impact. Although there is no specific format requirement, FHWA Technical Advisory 6640.8A provides a suggested format to be used for an EA.

The subject areas to be addressed include project description, need, alternatives considered, impacts, and comments and coordination. The EA is subject to FHWA approval before it is made available to the public as an FHWA document. The document itself need not be circulated but must be made available for public inspection and comment. A notice of availability must be sent to state and areawide clearinghouses and should be published locally. The availability period for an EA is usually 30 days.

Exhibit 6: Environmental Study Process



If, after completing the EA, it is determined that there are no significant impacts associated with the project, a Finding of No Significant Impact (FONSI) is prepared. The FONSI includes the EA modified to reflect all applicable comments and responses to those comments. No formal circulation is required; however, the state clearinghouse must be notified of the availability of the FONSI, and FHWA recommends that the public be notified in local publications.

If at any time a significant impact is identified, an Environmental Impact Statement (EIS) must be prepared. The Technical Advisory T6640.8A provides guidance on the required format and the type of information that should be developed in the EIS. Between the draft and final EIS, TDOT and the FHWA division office consider and prepare responses to all substantive comments received on the draft EIS, including those from the public hearing. The final EIS must identify and describe the preferred alternative and the basis for the decision, demonstrate compliance to the extent possible with all applicable environmental laws and Executive Orders, provide reasonable assurance that the requirements can be met, include copies of comments received and responses, note where the EIS was changed in response to comments, and explain any other changes or corrections.

If the highway project only receives state funding, the above process is modified (see Exhibit 6). The department prepares an APR, and then the Environmental and Planning Section management (Assistant Chief Engineer of Planning and/or Director of Environmental Planning) will decide on the type of report to prepare. Management will decide to either conduct no study (if there is no significant Right-of-Way or permits are not required), conduct a Technical Study (an ecological, archeological, or historical study, or a combination of each), or prepare an EA in accordance with NEPA but not submit it to FHWA or other state or federal agencies unless permits are required. After these reports are prepared, the department holds public hearings to allow public input before a final decision is made. The Assistant Chief Engineer for Planning indicated that there is no written policy or guideline concerning the type of environmental study that the department conducts if a highway project is funded with only state funds. The decision is made on a case-by-case basis. (See finding 6.)

Designing the Highway Project

Once the environmental document is completed, the project is sent to the Design Section. The director of the Design Section stated that the department uses a set of Standard Drawings (approved by the department for statewide use) and a set of design guidelines that give more information concerning the drawings, such as replacement rates for straw bales or silt fences.

The standard drawings were developed from erosion control information obtained from the state of Virginia. The department made a copy of Virginia's manual and developed a set of Best Management Practices (BMPs). The department also provided a copy of the BMPs to the Tennessee Department of Environment and Conservation. Later, the department reviewed the manual and developed a set of Standard Drawings. The drawings include official descriptions, units of measure, and item numbers used in reporting costs for reimbursement. The drawings also provide specifications concerning how the erosion-control devices are to be installed. The

Design Section also has a *Design Guidelines Notebook* that has a specific section for erosion control.

Monitoring for Environmental Compliance at the Project Construction Site

At the four regional offices (Knoxville, Chattanooga, Nashville, and Jackson), there is an Environmental Coordinator who is responsible for monitoring erosion control at the construction and maintenance projects. The Environmental Coordinator also works with the Tennessee Wildlife Resources Agency (TWRA), TVA, and Army Corps of Engineers (COE). The Environmental Coordinator also serves as the liaison between the Department of Transportation (DOT) and the Tennessee Department of Environment and Conservation (TDEC). DOT also assigns project inspectors to monitor the construction site. These inspectors report back to the project supervisor, who in turn reports to the regional construction supervisor. Erosion control is one of the areas that the inspector is responsible for monitoring.

Preconstruction Conference:

The project supervisor is responsible for setting up the Pre-Construction Conference that is held with the primary contractor, subcontractors, utility companies, and applicable local officials. This conference is held prior to any activities beginning at the construction project site. The project supervisor serves as the chairperson of the conference. Department personnel, usually the Environmental Coordinator, stress the importance of erosion control with both the construction contractor and the utility companies. The preconstruction conference is mandatory, and the contractor must submit an erosion control letter that states that the contractor will comply with requirements indicated in the permits and contract concerning erosion control. A Preconstruction Conference form serves as a checklist to indicate that specific topics are covered, and these forms remain in the project file during construction. The minutes from the conference are also placed in the construction project file.

Monitoring the Construction Site:

As mentioned above, the department has project inspectors assigned to each construction site. Most inspectors are assigned more than one project and will not necessarily be at the construction project all of the time. The inspector will prepare a daily document at the construction sight until the job is completed (Project Daily Diary and Erosion Control Diary). The inspector also submits an erosion control report each month and also quarterly to the project supervisor at the field office. If the inspector finds any erosion control deficiencies, it is recorded in the Erosion Control Diary, and the contractor and/or foreman is informed. The language in the contract requires that erosion control deficiencies must be corrected or worked on within 24 to 48 hours.

The audit included two different file reviews. One file review randomly selected 30 files (10 from each of the three grand divisions of the state) from the list of 1986 highway projects. The second file review included 21 current highway projects from the four regional offices. The file review documented that contractors for 2 of the 21 regional projects (contract numbers 1180 and 6031 in Region 4) received an Notice of Violation (NOV) from TDEC. A review of county information at TDEC revealed that contractors for 4 of the 30 projects from the 1986 Highway

Project listing received an NOV. The contractor for one of the 1986 highway projects received a Notice of Non-Compliance (NONC). The contractor for one of the four 1986 highway projects that received an NOV was also issued a Final Order and fine of $350,000 (State Route 840 South). According to a newspaper article (Memphis *Commercial Appeal*, 9/20/01) the same contractor was issued another NOV and fined an additional $500,000.

APPENDIX B
TITLE VI INFORMATION

All programs or activities receiving federal financial assistance are prohibited by Title VI of the Civil Rights Act of 1964 from discriminating against participants or clients on the basis of race, color, or national origin. In response to a request from members of the Government Operations Committee, we compiled information concerning federal financial assistance received by the Department of Transportation, and the department's efforts to comply with Title VI requirements. The results of the information gathered are summarized below.

According to *The Budget: Fiscal Year 2001-2002,* the department was to receive $943 million in Federal Aid Construction. The department's Planning Division provided $3.8 million in Federal Funding to Local Governments for fiscal year 2001 Unified Planning Work Program and $8.3 million for Public Transit, Rail and Waterways. The department's Program Development and Administration Division provided $15.9 million for Enhancement Programs, Optional Safety Programs ($50,000 grants), and Service Transportation Programs.

The department submits reports and evaluations to U.S. Department of Transportation (U.S. DOT) officials to demonstrate how well the department is meeting its goals and objectives. The Title VI Section of the Civil Rights Office has the following staff: one director, three professional staff, and one support staff in the central office; and two professional staff working in regional offices. The Title VI Director has the following duties:

- serving as an informational resource to the commissioner, deputy commissioner, division chiefs, and directors;
- developing and implementing the department's *Title VI Handbook*;
- monitoring Title VI activities and the enforcement of Title VI procedures as reflected in state and federal statutes;
- training the department staff, beneficiaries, and other interested parties on the laws, rules, and budgetary priorities necessary to ensure and promote compliance with Title VI;
- sending reports and evaluations to U.S. DOT officials to determine how well the department is meeting its goals and objectives; and
- initiating and monitoring Title VI activities.

The department submitted the Title VI Compliance and Implementation Plan (June 29, 2001) to the FHWA, Comptroller of the Treasury, and Representative Henri Brooks. In order to increase staff knowledge of Title VI, the Title VI Division, in conjunction with the Personnel Office, provided Title VI training to 24 Title VI coordinators (20 central office staff and one staff member from each of the four regional offices). Also, Title VI literature is disseminated to all department employees. New employees undergo a Title VI orientation as part of their new-employee orientation, and the department has documented Title VI information in the employee handbook that is distributed to all employees.

The Title VI Office hosted several regional workshops. The objectives of the workshops were to identify critical Civil Rights/Title VI issues, to allow the community to interact with the Title VI coordinators in other state agencies, and to participate in forum sessions, present problems, and propose solutions to Title VI issues. The Title VI office conducted four workshops across the state (Clarksville, Memphis (2), and Nashville). State and local officials, businesses receiving government financial assistance, and community leaders attended these workshops. The Title VI office also conducted training sessions during fiscal year 2001. The department provided training programs for 13 urban and rural transit systems, 14 cities and counties, and 20 regional organizations (including the department's regional offices, and regional and local entities). The department also completed 22 on-site reviews and 7 pre-award grant on-site reviews.

The Title VI coordinators have the responsibility for collecting data surveys, evaluations, and other pertinent documentation in accordance with Title VI regulations. Additionally, two Title VI officers (covering Regions 1 and 2 and Regions 3 and 4, respectively) conduct on-site reviews through observations and documentation of Title VI compliance requirements. These reviews are conducted through on-site inspections of department contractors, and all program areas (Planning, Project Development, Right-of-Way, Construction, and Research) are reviewed. Through these reviews, information flows from Title VI coordinators and program administrators to the Title VI officers and back from the Title VI officers to ensure accurate information on compliance with Title VI program requirements. If during these on-site reviews or at any other time a deficiency is discovered, the program administrator is given 30 days in which to remedy the noncompliance. All information received through these reviews is kept on file in the Title VI office for compliance reporting.

Title VI officers also monitor policy manuals, employee handbooks, and bulletins to ensure inclusion of Title VI statements. The Title VI staff promptly investigates all complaints of alleged discrimination, attempts to resolve such complaints, and takes corrective action within 30 days of receipt of the substantiated final report. According to the Title VI Implementation Plan, if the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the Title VI staff informs every complainant of all of his or her avenues of appeal.

All contractors/subcontractors and lessors are notified of their responsibilities under Title VI and of their ensuing obligations through language included in each contract agreement. The department ensures Title VI compliance through reporting and monitoring procedures maintained to ensure compliance with provisions of Title VI and implementing rules and regulations of the U.S. Department of Transportation. All staff with contracting authority and contract management responsibility, including all managers, are educated on minority/women contracting issues, objectives, and procedures. Staff also receive orientation to understand the components of small business outreach, solicitation, and procedures monitoring.

When the department receives a Title VI complaint, the Title VI office determines whether the complaint states a valid claim. A copy of the complaint is immediately forwarded to the Tennessee Human Rights Commission for jurisdictional determination. If the complaint states a valid claim, it will be accepted for processing immediately upon acknowledgement of its

receipt, and the complainant and the department will be notified. If the Title VI office does not accept the complaint, it will be rejected and, if appropriate, referred to a federal agency.

Five complaints have been received in the past two years. One case was dismissed because of insufficient information to substantiate the claim. Another complaint was received December 21, 1999. The Federal Highway Administration and the Human Rights Commission were notified of the case on January 4, 2000. According to the Title VI Director and a review of the file, the U.S. DOT is currently investigating the case and resolution is pending. The U.S. DOT indicated that the state department would not be able to conduct the investigation because the complaint was against the state. The third complaint was received December 20, 1999, and was a gender complaint against a subcontractor. The complaint was substantiated, and a request for mediation between the two parties was prepared on August 31, 2000. However, before mediation could occur, the complainant decided mediation would not be necessary, especially since there was a positive change in the behavior of the prime contractor. Another citizen issued a complaint against the department because expected sidewalk improvements had not occurred. The complaint was substantiated, and a final report was prepared on August 28, 2000. The City of Chattanooga made the needed improvements to the complainant's sidewalk. Another complaint concerned the Division of State Parks and was referred to the Department of Environment and Conservation.

Auditors contacted the department's Executive Administrative Assistant concerning a list of vendors that the department had contracts with. They were informed that the list would only contain the Primary Contractors (the Primary Contractors contract with the subcontractors) and the list would be over 400 pages. The list would come from the Finance and Administration STARS (State of Tennessee Accounting and Reporting System) and would not include ethnicity information. Due to the size of the listing of contractors, this information is not included in the audit report. The department has contracts with 201 consultants and 625 contractors.

A summary of the department employees' gender and ethnicity is included below.

Staff of the Department of Transportation by Title, Gender, and Ethnicity

As of June 2001

Title	*Gender*		*Ethnicity*			
	Male	**Female**	**White**	**Black**	**Asian**	**Other**
Accounting clerk	2	41	39	4	0	0
Accounting manager	4	1	4	1	0	0
Accounting technician	2	6	3	5	0	0
Accountant	5	6	8	3	0	0
Assistant commissioner	2	0	2	0	0	0
Administrative assistant	0	7	7	0	0	0
Administrative services assistant	22	34	49	6	0	1
Administrative secretary	0	50	44	4	0	2
Aerial photographer	2	1	3	0	0	0
Aerial technician	3	0	2	0	1	0
Aerial personnel supervisor	1	0	1	0	0	0
Affirmative action director	1	0	0	1	0	0
Affirmative action officer	2	1	0	2	0	1
Aircraft scheduler	1	0	0	1	0	0
Archaeologist	3	0	3	0	0	0
Archaeologist supervisor	1	0	1	0	0	0
Aircraft chief pilot	1	0	1	0	0	0
Aircraft lead pilot	4	0	4	0	0	0
Aircraft mechanic	2	0	2	0	0	0
Aircraft pilot	2	1	3	0	0	0
Attorney	3	2	4	1	0	0
Audit director	0	1	1	0	0	0
Auditor	3	6	9	0	0	0
Automotive mechanic	2	0	2	0	0	0
Aviation manager	1	0	1	0	0	0
Biologist	3	2	5	0	0	0
Building maintenance worker	6	1	7	0	0	0
Board member	5	1	6	0	0	0
Budget analyst	2	0	2	0	0	0
CADD supervisor	9	4	12	1	0	0
CADD technician	66	25	67	20	2	2
Civil engineer administrator	2	0	2	0	0	0
Civil engineer director	4	0	4	0	0	0
Civil engineer manager	41	2	42	1	0	0
Civil rights director-DOT	1	0	0	1	0	0
Clerk	5	47	45	6	0	1
Computer operations manager	1	0	1	0	0	0
Computer operations supervisor	0	1	0	1	0	0
Contract compliance officer	2	6	3	5	0	0
Commissioner	1	0	1	0	0	0
Communications dispatcher	10	11	16	5	0	0
Custodial worker	12	5	2	15	0	0
Data operations supervisor	0	1	1	0	0	0
Database administrator	0	1	1	0	0	0
Deputy commissioner	1	0	1	0	0	0
Drafter	3	0	3	0	0	0
Data processing operator	2	7	4	5	0	0
Data processing operator supervisor	0	1	0	1	0	0
Drafter supervisor	1	0	1	0	0	0
Drafting technician	2	1	3	0	0	0
Distribute computer operator	1	2	0	3	0	0
Distributed programmer/analyst	4	4	6	1	1	0

	Gender		Ethnicity			
Title	Male	Female	White	Black	Asian	Other
Electrician technician	1	0	1	0	0	0
Emergency management area coordinator	1	0	1	0	0	0
Environmental coordinator-transportation projects	4	0	3	1	0	0
Environmental specialist	5	1	6	0	0	0
Equipment mechanic	156	0	146	9	0	1
Equipment maintenance director	1	0	1	0	0	0
Equipment maintenance supervisor	9	0	9	0	0	0
Equipment service worker	24	2	18	7	0	1
Executive administrative assistant	7	4	10	0	0	1
Executive secretary	0	1	1	0	0	0
Facility manager	2	0	2	0	0	0
Fiscal director	4	3	7	0	0	0
Fleet manager	1	1	2	0	0	0
Fleet supervisor	1	0	1	0	0	0
General counsel	0	1	1	0	0	0
Geologist	2	1	2	1	0	0
Grants analyst	1	1	1	1	0	0
Grants program manager	0	1	1	0	0	0
Historical preservation specialist	0	2	2	0	0	0
Horticulturist	3	0	3	0	0	0
Historical preservation specialist supervisor	0	2	2	0	0	0
Highway maintenance assistant county supervisor	86	1	77	10	0	0
Highway maintenance county supervisor	90	0	83	7	0	0
Highway maintenance floating crew supervisor	48	0	41	7	0	0
Highway maintenance superintendent	52	0	51	1	0	0
Highway maintenance worker	1,218	83	1,058	240	0	3
Highway response supervisor	12	1	11	2	0	0
Highway response operator	51	1	42	9	0	1
Information resource support specialist	20	9	24	4	1	0
Information officer	0	1	1	0	0	0
Information systems analyst	5	2	7	0	0	0
Information systems director	2	0	2	0	0	0
Information systems manager	7	3	10	0	0	0
Landscape architect	1	0	1	0	0	0
Legal assistant	0	2	2	0	0	0
Librarian	0	1	1	0	0	0
Materials associate	28	1	27	1	0	1
Materials assistant	71	11	73	6	0	3
Materials manager	2	1	3	0	0	0
Maintenance carpenter	7	0	7	0	0	0
Maintenance electrician	3	0	3	0	0	0
Motor vehicle management administrator	1	0	1	0	0	0
Motor vehicle management director	1	0	1	0	0	0
Offset press operator	5	2	4	3	0	0
Office supervisor	0	4	4	0	0	0
Operations specialist	198	21	201	10	5	3
Operations specialist supervisor	78	1	76	2	0	1
Personnel analyst	0	4	4	0	0	0
Personnel director	1	0	1	0	0	0
Personnel manager	2	2	4	0	0	0
Personnel technician	0	2	1	1	0	0
Personnel transaction supervisor	0	1	0	1	0	0
Photogrammetrist	7	2	8	1	0	0
Photogrammetrist supervisor	2	0	1	1	0	0
Printing service superintendent	1	0	1	0	0	0
Printing service supervisor	2	0	0	2	0	0
Procurement officer	4	3	7	0	0	0

	Gender		Ethnicity			
Title	**Male**	**Female**	**White**	**Black**	**Asian**	**Other**
Procurement unit manager	1	0	1	0	0	0
Publications editor	0	2	2	0	0	0
Radio communication technician	4	0	4	0	0	0
Radio communication technician supervisor	1	0	1	0	0	0
Radio systems analyst	1	0	1	0	0	0
Roadway specialist	111	32	114	17	9	3
Roadway specialist supervisor	44	7	40	4	4	3
Right-of-way agent	41	13	49	4	0	1
Right-of-way appraiser	24	1	25	0	0	0
Railroad safety specialist	3	0	3	0	0	0
Railroad safety inspector	5	0	4	1	0	0
Small business development director	0	1	0	1	0	0
Secretary	71	3	64	9	0	1
Storekeeper	25	9	28	6	0	0
Stores clerk	7	5	9	3	0	0
Structure specialist	36	8	36	3	4	1
Structure specialist supervisor	23	2	20	1	3	1
Student assistant	1	0	1	0	0	0
Systems programmer	1	1	2	0	0	0
Telephone operator	0	2	2	0	0	0
Title VI director	1	0	0	1	0	0
Traffic technician	6	5	6	5	0	0
Traffic technician supervisor	2	0	2	0	0	0
Training officer	2	1	2	1	0	0
Training specialist	4	1	5	0	0	0
Transportation administrator	2	0	2	0	0	0
Transportation administration director	1	0	1	0	0	0
Transportation aide	17	6	21	2	0	0
Transportation assistant	372	96	396	65	1	6
Transportation director	9	0	9	0	0	0
Transportation manager	54	12	63	2	0	1
Transportation planner	50	21	58	13	0	0
Transportation regional assistant director	5	0	5	0	0	0
Transportation regional director	4	0	4	0	0	0
Transportation safety manager	0	1	1	0	0	0
Transportation specialist	19	4	20	3	0	0
Transportation surveys supervisor	9	1	9	1	0	0
Transportation technician	492	48	505	34	0	1
Vehicle operator	1	1	1	1	0	0
Word processing operator	0	2	1	1	0	0
TOTAL	3929	743	4003	598	31	40